TRAINING FOR SKILL

An investigation into the problems of training for skill,
particularly at the craft level,
and an appraisal of the significance of the findings
in relation to social and economic efficiency.

by

Donald McPherson

M.A., M.Ed., F.E.I.S., A.M.B.I.M.

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C O N T E N T S

P R E F A C E

This thesis is divided into two parts. Part One describes an investigation which was conducted across the industrial belt of Scotland into the problems of industrial training, particularly at what is called the craft apprenticeship level, and gives the resultant findings. Part Two contains an historical account of the development of the apprenticeship system which is still important in British industry, reviews vocationing training practices in other countries, and considers the implications of the accumulated evidence in relation to the concept of training for skill.

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INTRODUCTION

THE PROBLEM

Shortage of Skilled Labour

In a Government White Paper of December 1962 (1), reference was made to the shortage of skilled labour in this country and the need to increase the rate of industrial training. The White Paper said (2):
"The objectives to be achieved can be stated as follows :-

(i) to enable decisions on the scale of training to be better related to economic needs and technological developments;

(ii) to improve the overall quality of industrial training and to establish minimum standards; and

(iii) to enable the cost to be more fairly spread."

In November 1963 these proposals were presented as a Bill under which the Minister of Labour (now the First Secretary of State for the Department of Employment and Productivity) would be given statutory power to set up Training Boards for the various industries, charged with a range of functions which might include establishing policy for training in the industry (admission to training, length of training, registration of trainees, appropriate attendance at colleges of further education, etc.) and dealing with such matters as standards of training, syllabuses for different occupations, associated technical education, advice and assistance about training to firms in the industry, tests for apprentices and others on completion of training and at intermediary stages, qualifications and tests for instructors, and the establishing and running of training courses in the Board's own training centres.

The/

(1) Ministry of Labour - Industrial Training : Government Proposals, Cmnd. 1892, H.M.S.O., December 1962.

(2) Ibid., p.4.

The Boards would collect money from firms in the industry by means of a levy and pay grants to firms actually involved in training to reimburse them on certain costs incurred in providing approved training.

The Bill became law in March 1964 under the title of the Industrial Training Act, 1964 (3).

The Industrial Training Act, 1964

The Industrial Training Act, in spite of its title, in fact covers the whole range of industry <u>and</u> commerce. It is concerned not only with activities at all levels but with "training" in the widest sense of the word including further education and, where necessary, retraining or further training. Prior to the passing of the Industrial Training Act, the Ministry of Labour was already making a direct contribution to training through the activities of its Government Training Centres, Instructor Training Colleges, Training within Industry Schemes, and its Industrial Rehabilitation Units. Its Manpower Research Unit has also been investigating the manpower trends and problems of our industrial society.

To these executive activities of the Ministry of Labour (now called the Department of Employment and Productivity) are now added the Industrial Training Boards for the various industries, set up under the Act, and the Central Training Council with its various committees and sub-committees which cover all aspects of industrial and commercial training and provide a service of practical help and advice on training to employers' organisations, joint councils and similar bodies, nationally and locally, and to individual companies. The Training Advisory Service "is particularly concerned with training for apprentices, non-apprentices, operatives and supervisors".(4).

The/

(3) Industrial Training Act 1964, H.M.S.O., 12th March 1964.

(4) Industrial Training Council booklet "Training Advisory Services available to Companies", October 1963, p.6.

The task of the Industrial Training Boards is broadly to implement, under the direction of the Department of Employment and Productivity and the guidance of the Central Training Council, the three main objectives outlined in the Government White Paper of December 1962.

The Present System of Training

Since the Middle Ages the traditional method of training has been the apprenticeship system which was formalised on a national basis by the Statute of Artificers in 1563. Under this Act anyone wishing to set up in a trade or craft had to be apprenticed for seven years to a master who undertook to teach the apprentice the necessary skills to become first a journeyman (eligible to journey anywhere each journee or day to work for any master craftsman of his craft at a journeyman's rate of pay) until perhaps within a year or two he became a master himself. The statute was applied only historically, i.e. to established trades and crafts but not to the new ones which emerged with change, and consequently more and more occupations grew up gradually outside the terms of apprenticeship. Although the statute was finally repealed in 1814, by which time the bulk of training took place outside the system in any case, the word "apprenticeship" had become associated with the concept of systematic training for the privileged few. As the Industrial Revolution developed in the 19th Century, most workers fell into the categories of less highly skilled work which was broadly classified as unskilled and semi-skilled.

In the 20th Century, with the explosion of knowledge, longer schooling, the expansion of democracy, the rapid increase in the pace of technical change, and the intensification of specialisation at the work place, the occupational structure has changed out of all recognition.

"Apprenticeship"/

"Apprenticeship", however, is still very much alive and still plays a key role in the training of a substantial percentage of the labour force who wish to become skilled workers. The typical apprenticeship scheme to-day is based on agreement between the appropriate employers' and trade union organisations under which the boy serves with his employer a stated time (16 to 20 or 21 years of age for most trades) as an "indentured" or, more often, "unindentured" apprentice for a wage below the skilled adult rate; the employer binds himself to see that the boy is taught the trade i.e. "all that the skilled craftsman should know". There is normally provision for day release, i.e. permission to attend classes at the local technical college for one day each week during session without loss of pay until the age of 18, the instruction being free of charge. Day release is not a statutory obligation and no action is taken against employers who do not release apprentices. The apprentice's wages increase annually until at the age of 21 he is accepted as a fully qualified skilled worker and is paid the skilled adult rate. The national agreements on recruitment and training are not mandatory and detailed application is left to individual firms and unions.

The assumption of the apprenticeship system is that the employer will arrange for the apprentice adequate on-the-job experience and training which, supplemented by related further education at the local technical college, will produce the skilled craftsman. It is also assumed that the basic principles of the old apprenticeship system, with its roots in the historical past, still apply, namely the protection of youth and the guarantee of systematic training.

What/

What Happens in Practice ?

What happens under the apprenticeship system in practice ? It has been under continuous criticism for some time but remarkably little objective evidence has been produced related to the actual range of work covered by apprentices and craftsmen. Criticism of structural defects is important (exclusiveness of the system, artificial age barriers, etc.) but any assessment of a system should surely begin by establishing what it actually does ? This thesis attempts to find some answers to the question of what happens under the apprenticeship system, examines the implications of the findings both in respect of historical explanation and present difficulties, and tries to develop a new concept of training for skill related to the complexities of the modern world and the country's needs and objectives.

PART ONE

INVESTIGATION AND RESULTS

CHAPTER ONE

DESIGN OF EXPERIMENT

A General Remark

A task that confronts every nation is that of cultivating the talents of its people. In the case of our own country, an island nation with stringently limited raw materials, a declining share of world markets, and a virtually static population, the development of our human resources within the framework of our strategic needs and objectives is a matter not just of social justice but of cultural and economic survival.

Industrial training is clearly an important facet of this human development, but only a facet; anything that stifles the growth of individual potential reduces our national efficiency. It is not the intention in this thesis, however, to encompass the whole field of human development since this would take us far beyond the confines of industrial training. On the other hand, the subject cannot be looked at intelligently in artificial isolation and some account has to be taken of the wider pattern of socio-economic activities and objectives that impinge directly or indirectly upon industrial training and influence its effectiveness.

The above considerations were taken into account in designing the shape of the enquiry.

Framework of the Enquiry

The central aspect of the enquiry consisted of an attempt to establish factual information about the range of operations performed by selected tradesmen and apprentices in three different crafts through the use of a check list of operations for each craft and a self-assessment answer booklet in which the individual indicated against each operation whether or not he had performed it or seen it. The answer booklet also contained an introductory page of personal particulars and other details to be completed by each student. For purposes of comparison, a group of Royal Naval artificer apprentices was included in the survey.

As a supplementary live check, an activity analysis was carried out of operations actually performed on the job on a building site by a number of tradesmen and apprentices belonging to one of the three selected crafts.

Since industrial training is related to job choice, supporting enquiries were conducted into the vocational "climate" within which choice of employment takes place. These enquiries covered prestige ratings of different industries and occupations by various groups of school-leavers, apprentices, tradesmen, and others, and also the collection of factual information about Youth Employment Service activities. The school-leavers were also asked to indicate choice of employment and to rate their school subjects both for usefulness in relation to job wanted and also in the order in which they liked them.

Finally, in order to compare craft workers and technologists, questionnaires were sent for completion to former Heriot-Watt Building technology students now holding professional appointments.

These various facets of the enquiry will now be described in more detail.

SURVEY OF THREE CRAFT SKILLS

Three important crafts - carpentry and joinery, electrical installation work, and mechanical engineering craft practice - were selected for investigation, and a questionnaire-type survey covering apprentices and tradesmen in different firms and industries was carried out during May and June, 1964, at Further Education Centres across the industrial belt of Scotland. The survey tried to establish the basic facts of work experience and further education by use of a check list of operations based on the approved range of training for each of the three crafts as laid down in the City and Guilds of London Institute * syllabus (see Appendices 2, 3, 4). The craftsmen and trainees indicated in an answer booklet (see Appendices 5, 6, 7) the extent to which they had covered the approved range of training, both at work and in further education, by marking the appropriate squares opposite each operation. Page two of the answer booklet called for personal particulars, background history prior to present job (including job wanted on leaving school, number of firms worked for, reason for leaving job, method of obtaining apprenticeship) and certain details of further education and training.

The weaknesses of questionnaires and the difficulties inherent in their administration are well known and precautions were taken to establish effective arrangements. The writer visited all the centres concerned on more than one occasion to give detailed explanations as to what was required and the exact procedure to be adopted (for example,

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* The City and Guilds of London Institute is the authoritative body in this country for the education and training of operatives, craftsmen and technicians. For a statement of the Institute's philosophy see Appendix 1.

more than one sitting was required for the completion of the answer booklets). In order that there should be no misapprehensions by students, the importance was stressed of teachers explaining carefully the meaning of each "operation", and - where necessary and possible - demonstrating an actual process, producing an actual piece of equipment, making a drawing, and so on. The Scottish Education Department lent its support to the arrangements and on his first visit to each of the centres the writer was accompanied by one of Her Majesty's Further Education Inspectors. As a result of these arrangements, the co-operation from teachers and students was generally good.

Under the supervision of the teachers at the colleges, the answer booklets were completed by 1,226 trainees and tradesmen (see Appendix 8), representing 99 different firms or establishments, including the Admiralty, and page two of all booklets was coded (see Appendix 9). After inspection, incomplete and incorrectly answered booklets were rejected. 268 answer booklets ((see Appendix 10(a)) were then selected for analysis in respect of the number of students not having done, at work and in class, each of the operations on the check list. The answers of two mechanical engineering groups - 15 students following a three years' full-time course at a Further Education Centre and the 34 Royal Naval Artificer Apprentices - were scored in full in two different ways, first on the basis of the number of students having done each operation occasionally/an average amount/a lot/never (see Appendix 21, Sub-appendices 1 and 2), and secondly on the basis of the number of operations done by each student occasionally/an average amount/a lot/never (see Appendix 22, Sub-appendices 1 and 2). In addition, 711 answer booklets (326 carpentry and joinery, 385 electrical) were punch-carded for computer analysis ((see Appendix 10(b)).

ON THE JOB ACTIVITY ANALYSIS

42 Carpenters and Joiners

As a supplementary live check, an on-the-spot activity analysis was conducted of operations actually being performed on a building site by 42 carpentry and joinery workers.

The Technique of Activity Analysis

The importance of establishing facts, as opposed to opinions, about what is happening in British industry, cannot be overstressed. It is, however, not possible to supervise and record every detailed activity in the industrial situation and management must rely upon some system of sampling; for example, the inspector checks the quality of output by selecting a few items from a large consignment and the building manager visits various gangs of operatives on the building site to see how work is progressing. Such techniques are likely to be unduly biased and misleading unless they are scientifically based. A useful technique is that of activity analysis which involves the statistical principle of random samples whereby any observation may be made at any given moment with as much likelihood as at any other moment. Random sampling may be obtained by use of prepared tables of random numbers or again in the case of an eight hour working day by numbering the minutes from 1 to 480 on separate pieces of paper, mixing the papers in a receptacle, and drawing out the required number of readings. The latter method was the one used in the investigation now to be described.

The Wimpey Muirhouse New Development Corporation Housing Scheme

During the months of January, February and March 1963, a final year Heriot-Watt Building Technology student took on-the-spot readings of joinery activities under the writer's direction, at the Wimpey Muirhouse New Development Corporation Scheme, Pennywell Place, Edinburgh 4. The

task/

task involved on this 23 acre site was the construction of multi-storey maisonettes as follows :-

13 blocks of 5 storey houses totalling 335 units
8 blocks of 4 storey houses totalling 148 units
8 blocks of 3 storey houses totalling 131 units
1 block of 2 storey houses totalling 6 units

The maisonettes were in turn specified thus :-

173 houses of 2 apartments
314 houses of 3 apartments
100 houses of 4 apartments
6 houses of 5 apartments

It was also proposed to build a fifteen-storey block on the site comprising 56 units and giving a high density of 75 persons per acre.

All the above categories were included in the investigation.

The type of house construction used was that of no-fines concrete, i.e. a type of concrete with no sand but only cement and coarse aggregate. The firm had built over 111,000 dwellings using this particular technique since it had been introduced in 1946 and had consequently had considerable experience of the activities involved.

Work started on the site in August, 1962, was scheduled for completion in February 1965, and the staff employed was :-

Site Agent	2 Bonus Clerks
Sub-Site Agent	Time Keeper
Site Engineer and Chain Boy	Storekeeper
Surveyor and Apprentice	General Foreman
Chief Clerk	and a Clerk of Works from Edinburgh Corporation

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The plant on the site included the following :-

4	22 R.B. Cranes with concrete skips
1	33 R.B. Crane with concrete skips
1	10 R.B. Crane with concrete skips
6	$1\frac{1}{4}$ cu. yds. shovels and buckets
4	JCB back acting shovels and buckets
1	Dinkham
1	Drot

The labour force employed on the site during the period of the investigation is given at Appendix 11 and the breakdown of the joiners into their respective squads is detailed at Appendix 12.

SUPPORTING ENQUIRIES

Supporting enquiries were also made into the prevailing vocational "climate" within which job choice takes place. These enquiries included first of all prestige ratings of various industries and occupations by school-leavers * and others; secondly, the collection of factual information from Youth Employment Service records designed to throw light on existing Youth Employment Service practice and limitations; and thirdly, - for comparison with craft level findings - a questionnaire-type enquiry involving 104 former Heriot-Watt Building Technology students. The detailed arrangements for each of these enquiries will now be explained.

Prestige/

* The school-leavers were also asked to state first, second and third choice of employment and to rate school subjects both for usefulness in relation to job wanted and in the order in which they liked them.

Prestige Ratings

The road to skilled employment lies through the educational system and before the young person begins to consider the question of his future career he has already acquired a hierarchy of values and prejudices which will bear directly upon choice of employment. In an attempt to assess some of these values, questionnaires were designed and distributed as follows :-

a) 24 Third Year Boys (Medium-sized Comprehensive School)
   27 Third Year Boys (Large Comprehensive School)
   19 Third Year Boys (Medium /Small Comprehensive School)
   70 Third Year Boys due to leave school shortly at age 15

b) 102 Day Release Joiners (aged 15 to 24, average age 19)

c) 54 Day Release Students - Bank Clerks (20), Sales Assistants (14), Shop Assistants (6), Clerks (7), and Storemen (7) (aged 16 to 20, average age 18)

d) 14 Day Release County Council Roadworks Employees (aged 19 to 52, average age 33)

e) 18 Final Year B.Sc. Building Engineering Students (average age 24)

f) 12 Final Year B.Sc. Mechanical Engineering Students (average age 24)

g) 29 Final Year B.Sc. Electrical Engineering Students (average age 23)

Examples of the questionnaires used are given at Appendices 13, 14(a) and 14(b).

Factual/

Factual Information from the Youth Employment Service

Two Area Youth Employment Offices were visited by the writer, Area X on 9.3.66. and Area Y on 3.3.66, and a random sample of 50 boys was selected in each office from the documents pertaining to the 15 year old school-leavers who left school in July, 1965. The analyses of these two sets of school-leavers are given at Appendices 15 and 16. During the visits on 3.3.66 and 9.3.66 a note was also made of all vacancies for boys on the Youth Employment Register; details of these vacancies are given at Appendix 17 (a) and 17 (b). Details of all boys leaving school in Areas X and Y for the year 1.10.63 to 30.9.64 are given at Appendix 17 (c).

104 Former Heriot-Watt Building Technology Students

Under the writer's supervision, a final year Heriot-Watt University Building Technology student conducted an enquiry in May 1965, into the education and training of former part-time and full-time students of the Building department of the (then) Heriot-Watt College. 34 out of 120 former Heriot-Watt part-time Higher National Certificate students covering the years 1952 to 1964 and 40 out of 70 former Heriot-Watt full-time students covering the years 1957 to 1964 replied to a detailed questionnaire (see Appendices 18 and 19). The full-time students had followed a three year's course for the Higher National Diploma in Building Technology or - selected students since 1959 - a four years' Honours or Pass Associateship in Building Technology. The questionnaires, modified to suit each group, covered mainly qualifications obtained, subsequent studies, employment history, method of obtaining present post, rating for subsequent usefulness of full-time or part-time subjects studied, and suggestions in the light of experience regarding the training of future students.

Observation/

Observation

It will now be apparent that the enquiry outlined in this chapter covered a substantial number of students and others involved in a wide range of activities over a considerable geographical area. The attempt was made to establish important factual information bearing on the industrial training of young craftsmen; in particular, although it was not possible to assess the quality of the work, the information on the range of activities undertaken throughout apprenticeship was critical and unique. The supporting enquiries were intended to aid the main investigation by giving additional insight into complementary aspects of the problem.

CHAPTER TWO

FINDINGS

In Chapter One, emphasis was placed upon the fundamental role of industrial training in the strategic task of developing the nation's human talents, and the design of the experiment to test the effectiveness of this contribution was outlined. This consisted of a questionnaire-type survey, of three-crafts, covering apprentices and tradesmen in different firms and industries across the industrial belt of Scotland, a supplementary live check by means of an on-the-spot activity analysis of operations performed on a building site by carpentry and joinery workers, and supporting enquiries into the prevailing vocational "climate" within which job choice took place, including prestige ratings of various industries and trades by school-leavers and others, the collection of factual information from Youth Employment Service records and - for comparison with craft level findings - a questionnaire-type survey involving former building technology students.

In the first part of this chapter the results obtained from the experimental work are presented and commented on, most of the factual detail being confined for convenience to appendices. Thereafter an attempt is made to summarise the more important trends in industrial training and related activities in Scotland, as suggested by the evidence. This summary crystallises the findings and provides some indication of the extent to which existing arrangements for craft

training/

training (including related further education and training, and vocational guidance) are in fact identifying, nurturing and developing the working potential of a substantial percentage of the nation's youth.

I SURVEY OF THREE CRAFT SKILLS

Analysis of Answer Booklets

1) Check List of Operations : Results

As explained in Chapter One, an attempt was made to measure the range of experience and training of young tradesmen and apprentices from three different crafts by use of a check list of operations based on the appropriate City and Guilds of London Institute syllabuses. Syllabuses, of course, are continually being revised and are never up-to-date in this modern world of rapid technological innovation, but measurement requires a yardstick, however imperfect, and the City and Guilds syllabuses were the most authoritative yardstick available.

a) Operations Done / Not Done at Work and Classes

The 268 students whose answer booklets were selected for analysis on the basis of the number of students not having done each operation at work and at classes ((see Appendix 10 (a)) included 66 carpentry and joinery students, 63 electrical students, and 139 mechanical engineering students. The answers given by them to the check list of operations (joinery 172 operations, electrical 130 operations, mechanical 271 operations) were scored and the results are shown at Appendix 20, Sub-Appendices Carp. (1) to Mech. (8). The answers of two mechanical engineering groups - 15 students following a three years' full-time course at a Further Education Centre and 34 Royal Naval

Artificer/

Artificer Apprentices - were scored first on the basis of the number of students having done each operation occasionally / an average amount / a lot / never, and secondly according to the number of operations done by each student occasionally / an average amount / a lot / never. The results for these two groups are shown at Appendix 21, Sub-Appendices 1 and 2, and Appendix 22, Sub-Appendices 1 and 2.

b) Computer Analysis of Punched Cards

The results of the punched card analysis done by computer are shown at Appendix 45. This shows the averaged out number of operations for each of the student groups concerned, namely 326 carpentry and joinery students and 385 electrical students. The averages cover operations done at work but not seen at college, operations done at work (occasionally / an average amount, often, never), operations done at college (occasionally / an average amount, often, never), operations seen at college (occasionally / an average amount, often, never).

c) Other Work Mentioned

The answers given by 385 students (123 carpentry and joinery, 185 electrical, and 77 mechanical) under "Other Work", i.e. operations performed in addition to the operations listed, are given at Appendix 23, Sub-Appendices Carp. (1) to Mech. (4).

d) 5 Electrical Tradesmen having done all or nearly all Operations

The employment records of 5 electrical tradesmen who had completed all or nearly all the 130 operations listed for electrical installation work are shown at Appendix 24.

e) Explanations of Findings offered by experienced Tradesmen, Teachers and Others

The findings for each group of students were discussed with experienced tradesmen, teachers, and others, knowledgeable in their own particular fields of activity, and the suggestions made by them to explain why particular operations had not been done are given at Appendix 25, Sub-Appendices Carp. (1) to Mech. (4). The explanations are confined mainly to those operations which 25% or more of the students had "never done".

2) Further Education and Training : Results

As mentioned earlier, page two of the answer booklets was coded (see Appendix 9) and the teachers at the colleges also marked each student's answer booklet with two percentage ratings based on his performance at college - a P (practical) and a T (theory) score. The page two replies were then punch-carded and analysed as indicated below.

a) Age in relation to year of course / type of course / group

Age analyses were made in respect of 1217 students including 364 carpentry and joinery students (age in relation to year of college course), 481 electrical students (age in relation to college course and group - for 10 different groups), and 372 mechanical students (age in relation to college course and group - for 9 different groups). The results of the analyses are shown at Appendix 26.

b) Course being taken and expected years of study

A comparison was made between the date each student started his college course and the date he gave as expecting to complete his studies. The results for 1162 students are shown at Appendix 27,

Sub-Appendices A/

Sub-Appendices A (364 carpenters and joiners), B (485 electricals), and C (313 mechanicals).

c) Examination performance and method of obtaining apprenticeship

Examination performance, i.e. the T (theory) score registered by the teacher on the basis of the student's performance at examinations in college, was compared with the method of obtaining apprenticeship, as recorded by the student, and the results for 1156 students are given at Appendix 28, Sub-Appendices A (362 carpenters and joiners), B (479 electricals), and C (315 mechanicals).

d) Examination performance and size of firm

A limited comparison of examination performance with size of firm was carried out and the results are given at Appendix 29.

3) Background History Prior to Present Job : Results

Other page two analyses carried out dealt with the student's background history prior to present employment, including job wanted on leaving school, number of firms worked for, reason(s) for leaving job(s), method of obtaining apprenticeship and how employed in present job. These are covered below.

a) Job wanted on leaving school

The answers given by 1186 students (363 carpenters and joiners, 447 electricals and 376 mechanicals including the Royal Naval Artificers) to the question "What kind of job did you want on leaving school ?" are given at Appendix 30.

b) Number of firms worked for since leaving school

The answers given by 949 students (348 carpenters and joiners 399 electricals, and 202 mechanicals) under the heading "Employment Record since leaving School" were analysed and the results in respect of the

number/

number of firms worked for are given at Appendix 31.

c) Reason for leaving job

From the employment record since leaving school an analysis was also made of the reasons given for leaving each job. The results for 332 students (116 carpenters and joiners, 153 electricals, and 63 mechanicals) are given at Appendix 32.

d) Method of obtaining apprenticeship

The answers given by 1185 students (362 carpenters and joiners, 447 electricals, and 376 mechanicals including the Royal Naval Artificers) to the question "How did you obtain your apprenticeship ?" are given at Appendix 33.

e) How employed

The answers given by 1152 students (363 carpenters and joiners, 447 electricals and 342 mechanicals) as to how they were employed are given at Appendix 34.

4) Consideration of Results

i) Check List of Operations

a) Operations Done / Not Done at Work and at Classes

Some of the "operations" are more correctly sub-headings from the City and Guilds syllabus and their relation to experience at work is a matter of interpretation by the respondent. Indeed, the whole exercise of replying to the check list of operations involves the process of self-assessment and all the replies to all the questions are in this sense subjective. It is not possible, therefore, to indicate the degree of accuracy of the findings but, in the light of the arrangements made, there is no reason to believe that the bulk of the replies analysed were not relatively accurate. For example, a student might have indicated that he had never carried out a particular operation when he had

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in fact done it but forgotten about it; treating the trends as relative and not absolute, we may infer that the operation in question was not one with which the student was particularly familiar.

Even a cursory glance at the findings indicates that there was no common pattern of experience from group to group (Appendix 20 results) or from student to student (Appendix 22). The range of operations covered during the various stages of apprenticeship at work and at college fell drastically short of the City and Guilds theoretical ideal, even the trademen's experience being quite limited. The fragmented and fortuitous training of almost all the students was highlighted by the wide fluctuations in experience from operation to operation as reflected by the number of students not having done the operation. Continued experience, as represented by age and years of apprenticeship, was no guarantee of widening of experience since the range of experience of the tradesmen ((Appendix 20, Carp. (1), Elect. (1), Mech. (1), Mech. (5), Mech. (7)) was as dramatically defective as that of the apprentices. At all stages of apprenticeship and also at the post-apprenticeship stage, the students showed lack of experience not only in the more advanced aspects of the skills involved but also in many of the earlier more elementary operations. The case of a group undergoing above average care and attention, namely the full-time experimental mechanical engineering craft group, was no exception; the variations - from operation to operation, from student to student, and in the frequency of performance with which each operation was assessed (occasionally, an average amount, a lot, never) - seemed to occur at random ((Appendices 20 Mech. (6), 21 (1) and 22 (1)). The evidence did, however, suggest that the range of work covered by these full-time day students (average operations never done at work = 52.5 and at classes = 112.5) was greater than that covered by the corresponding mechanical engineering craft practice day release students ((Appendix

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20, Mech. (2) and Mech. (3)). Even more interesting, however, was the fact that the Royal Naval Artificer apprentices had covered a wider range of operations than the best of the mechanical students, with average operations never done at work = 48 and never done at classes = 37, against 52.5 and 112.5 respectively for the 15 full-time mechanical engineering craft students. The variation from firm to firm among the mechanical craft students emphasised the fragmented nature of industrial training based on the specialised needs of the individual firm, whereas the results obtained by the naval apprentices - who were being tested, after all, against an industrial syllabus which was not their own - might have reflected the broad-based approach by the Admiralty, which stressed general naval requirements rather than specific requirements such as those of one ship.

"Training" seemed to involve the learning of a restricted range of operations at a fairly early age and "experience" seemed to consist of a continuation of practice through the years of apprenticeship of this limited "core" work with only a slight extension in the range of operations encountered.

b) Computer Analysis of Punched Cards

The fluctuation from group to group (Appendix 20 results) and from student to student and firm to firm (Appendix 22 results) have already been noted. Appendix 45 confirms these fluctuations from group to group, not only at work but also at college. There were quite marked variations in the average number of operations performed by the different college groups, both at work and in college at each stage (1st Year, 2nd Year, 3rd Year) of their college attendance. Thus, to

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the fortuitous arrangements of the particular firm were added the fortuitous arrangements of the particular college.

The operations done by the carpenters and joiners at work (Occ / Av and Lot columns) showed on average a steady increase from year to year, particularly in respect of operations done a lot, but in the case of operations not done at work (Never column) the 2nd and 3rd Year students averaged about the same while the 1st Year students showed fewer operations not done. The figures suggested that the 1st Year college trainees of 1964 were exposed to a slightly wider range of operations than the 1st Year college trainees of 1963 and 1962. At the same time, however, there was a marked tendency towards the repetition of operations (i.e. Done a Lot column). In brief, the trend towards the repetition of particular experiences (or operations) was quite emphatic but the figures did not suggest any great widening of experience. Similarly, operations done by carpenters and joiners at college (Occ / Av and Lot columns) showed on average a steady increase from year to year but again in the case of operations not done at college there was no marked increase from year to year. The suggestion was that the college, like the firm, was inclined to repeat rather than widen the students' experience after the first year. There was no marked variation in the operations not seen by the joiners at college from year to year although there was a steady increase from year to year in the operations done at work but not seen at college. This might suggest that the widening of experience after the first year was even more restricted at college than it was at work. These trend figures for carpentry and joinery, together with the inconsistencies between the various groups, suggested that chance factors (the particular firm, the particular college) were unduly important in determining the degree of training and the range of experience

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that each apprentice would undergo; the training of carpentry and joinery apprentices appeared to be governed as much by chance exposure as by controlled, systematic arrangements and procedures.

The operations done by the electrical installation Course A students at Work (Occ / Av and Lot colums) also showed on average an increase from the 1st to the 2nd Year but unlike the carpenters and joiners, these electrical installation (A) students showed a distinct average drop between the 2nd and 3rd Year in operations done (Occ / Av and Lot columns). As regards operations not done at work (Never column) the electrical installation Course A students showed on average a progressive decrease from year to year in the number of operations done at work but not seen at college. These figures suggested that the electrical installation (A) students underwent a more progressive broadening of experience with less repetition of operations than was the case with the carpenters and joiners. Operations not done at college and not seen at college (Never columns) by electrical installation (A) students also showed on average a progressive decrease. All in all, the electrical installation Course A students appeared to undergo less restricted and less repetitive training, both at work and at classes, than the carpenters and joiners. On the other hand, the variations from one group to another suggested that as with the joiners the chance factor (particular firm, particular college) was critically important in determining training experience in the case of electrical installation (A) students, the range of experience offered by the different colleges (compare Never Done columns and Never Seen columns) being particularly uneven. These trends were generally confirmed by the electrical installation Course B students, while the electrical fitters and mining electrical students showed more fluctuations.

Thus/

Thus, the computer analysis of these 711 students confirmed the variations in the training of apprentices according to the particular geographical area and the particular college. Since working experience took place in individual firms, the geographical differences no doubt represented the summation of varied experience by different students in different firms, the critical factor in the variation being experience within the individual firm rather than the location of the firms.

c) Other Work Mentioned

The list of operations quoted by students under "Other Work Mentioned" (Appendix 23) suggests that the less sophisticated the work, or alternatively the more specialised the sub-group involved, the more likely are we to find a common "core" element. Thus the carpenters and joiners from the less sophisticated Construction Industry showed a greater common "core", including the construction of portable sheds, timber garages, pivot hung sashes, greenhouses and asbestos roofing. Most of the specialised sub-group of 79 mining electrical craft workers mentioned the mine and quarry regulations, planned maintenance, and most of the other items listed at Appendix 23, Elect. (1), while the electrical installation students ((Appendix 23, Elect. (2)) frequently listed underfloor heating, burglar alarms, battery charging, and rectifier circuits, and the mechanical engineering technicians ((Appendix 23, Mech (1)) all mentioned inspection and welding. At the same time, even among the specialised sub-groups there was also evidence of considerable variety under "Other Work Mentioned", as instanced by the list of individually itemised operations by carpenters and joiners ((Appendix 23, Carp (1), (2), (3) and (4)), electrical students

((Appendix 23, Elect (2)), and mechanical students ((Appendix 23, Mech (1)).

Thus we find a variety of sub-groups of workers practicing varying sub-groups of skills in a variety of industries and sub-groups of industries, work experience being related to the sub-group, the sub-industry, the range of work practiced in the particular firm, and the actual tasks allotted to the individual. This explains the lack of a common pattern. The words "joiner", "electrician" and "mechanic" are, in fact, rather nebulous job titles which obscure wide variations in occupational activities. The words can take on meaning only after an analysis of the particular activities being carried out by each particular individual in each particular firm.

The machine shop engineering apprentices and tradesmen, the mechanical engineering technicians, and the production engineering tradesmen, all of whom might be expected at some time to supervise craft workers, gave evidence of only limited experience of craft practice work. Similarly, the electrical installation B students ((Appendix 20, Elect (4)) who were following a superior course to the electrical installation A students, indicated only restricted experience of the simpler electrical installation A course work.

d) 5 Electrical Tradesmen having done all or nearly all Operations

The employment record of five electrical tradesmen who claimed experience of all or nearly all operations at work (Appendix 24) suggested that breadth of training required individual initiative and mobility between firms and industries.

e) Explanations of Findings offered by experienced Tradesmen, Teachers and Others

Finally, the explanations suggested by experienced tradesmen,

teachers/

teachers and others as to why particular operations had not been done ((Appendix 25, Sub-Appendices Carp (1) to Mech (3)) may be conveniently classified thus :-

Influence of technological change

Demarcation / restrictive practices

Size of firm - likely to be done only by large firms

Size of firm - likely to be done only by small jobbing firms

Problems of time and expense at classes, e.g. selected models and selected students only.

ii) Further Education and Training

Among the carpenters and joiners there was a wide spread of 3 to 5 years in the age of students on the same course. Since selection difficulties made it impossible to obtain a strict cross-section of the students at college, the apparently marked drop-out of students after the third year would require to be checked with the college registers. At the same time it can be seen that there was no evidence of a marked drop-out at 18 years of age regardless of how far a student had progressed. There might probably be a drop-out on completion of the third year of the course but here again confirmation would be needed from the colleges. Many of the carpenters and joiners would no doubt tend to complete the three years' intermediate stage of the City and Guilds Course around the age of 18 and then withdraw from college but there is no positive evidence in the figures to suggest that those repeating years were pulled out when they reached 18. The figures also show that for each of the first three years almost one third of the carpenters and joiners were beyond the age that would permit them to complete the fifth year by the time they were between 20½ and 21½;

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in fact about half of them would not complete the fifth year by the age of 21 exactly.

In the case of the electricals and mechanicals there was also a wide spread of 3 to 5 years in the age of students in the same course, though inspection shows that the individual classes varied less than with the carpenters and joiners and that the electricals had a wider age spread than the mechanicals. Although some of the mining mechanical students tended to be older than the general average, the mechanical students showed a good age distribution with the spread, as expected, increasing in the third, fourth and fifth years. The average age for each group of mechanicals and electricals, progressing year by year, indicated a measure of repeating.

Unlike the carpenters and joiners, the electricals and mechanicals had a spread of students into much older age groups. In this connection it should be noted that carpentry and joinery students become "qualified" craftsmen at the age of 21 irrespective of educational performance and this "easy passage" may be a strong disincentive to continued study. Any further development of the individual joiner's potential may be an "academic" exercise which has to be balanced against material on-the-job rewards, e.g. lucrative incentive bonus schemes and high overtime wages. On the other hand, the ultimate professional classification of electrical and mechanical students within the engineering industry will be greatly influenced by the qualifications they obtain; they may ultimately rate as craftsmen, technicians, or professional engineers, according to educational performance in the long run and the incentive to further study is therefore greater. This may be one of the important factors accounting for the spread of electrical and mechanical students into much older age groups.

The/

(Appendix 27)

The pattern of expected years of study for carpenters and joiners/ was broadly similar to the pattern of actual events as illustrated in Appendix 26. The expectation was that a substantial drop-out of carpenters and joiners would take place on completion of the third year. In the case of the electrical and mechanical students the expected drop-out at the end of the third year was less marked, which again reflected the pattern of actual events as shown at Appendix 26. The figures also suggested that the expected years of study for engineers rise as the skill level of the group rises. Thus, the expected years of study were lower at the craft level (electrical installation work, electrical fitting, mechanical engineering craft practice), higher at the technician level (machine shop engineering, mechanical engineering technician), and highest towards the professional level (production engineering).

In considering the relationship between examination performance (or T Score) and method of obtaining apprenticeship (see Appendix 28), a major difficulty was the absence of any common yardstick of assessment. Standardised regional tests would reduce considerably the subjective element in assessing the performance of students from different firms, different classes, and different colleges. Since this type of measurement would presumably be of value to the Industrial Training Boards, the matter would seem to merit further detailed research. Regarding examination performance (T Score) and size of firm (see Appendix 29), there was an indication of some measure of variation between the examination performance of the students from different firms and this point also merits further normalised research.

iii)/

iii) Background History Prior to Present Job

The answers to the question, "What kind of job did you want on leaving school ?" may be subjective in that the student's opinion, even if recorded in good faith, reflects an impression at a later date. The student's memory, for example, may be at fault, he may have subconsciously rationalised the true facts, or he may have been incapable of appraising the situation adequately. With these provisos we may look at the evidence (Appendix 30). About two-thirds of the carpenters and joiners wanted a carpentry and joinery apprenticeship with engineering apprenticeship covering most of the others. More than half the electrical students wanted electrical work and the vast majority wanted some form of engineering. The vast majority of the mechanical students also wanted some form of engineering but the pressure for mechanical work among mechanical students was less than the pressure for electrical work among electrical students.

Regarding the number of firms worked for since leaving school, the trend indicated (Appendix 31) is that it is quite normal for a student to change his firm after a few years. According to the students concerned, the motivating force in changing employment (Appendix 32) was - in the vast majority of cases - improved prospects, particularly in respect of variety of work and experience. The picture suggested is that of young persons chasing better prospects and experience as they become increasingly aware of the severely restricted opportunities for training, experience and development in the individual firm. Similarly, the replies to the question "How did you obtain your apprenticeship ?" (Appendix 33) do not suggest any effectively organised social arrangements. About two-thirds of the carpenters and joiners, over

half/

half the electricals, and less than half the mechanicals claimed to have obtained their apprenticeship through their own initiative or that of a friend or relative although there was a suggestion that advertisements might be of some consequence in recruitment for the engineering industry but not for the construction industry. It seemed that in engineering, the more sophisticated industry, the pattern of approach to apprenticeship was more varied. The overall impression for all three skills, however, was of young persons chasing jobs rather than of controlled transition into industry.

The analysis of the nature of employment (Appendix 34) indicated that the big majority of carpenters and joiners were employed in general building, with maintenance and jobbing work also of importance; installation and maintenance work accounted for a high percentage of the electrical work; and production was of overwhelming importance for the mechanicals with maintenance work by far the next most substantial activity.

II ON-THE-JOB ACTIVITY ANALYSIS

Analysis of Results of Wimpey Investigation

The results of the activity analysis undertaken on the Wimpey Muirhouse site are detailed in Appendices 11 and 12, already mentioned, and also Appendices 35, 36, 37, 38 and 39.

The working squads involved (see Appendix 12) were considered to be well organised and scheduled, as a consequence of many years of experience in this type of work and the results generally would appear to justify this contention. The percentage of time during which the operatives were active (88.5%) is high when compared with other studies on building sites and factories in general.

"Fixing/

"Fixing or Erecting Materials" together with "Positioning and / or Plumbing Materials" (see Appendix 12) accounted for approximately half the joiners' and apprentices' squads working time, a fairly satisfactory result since these were the major operations. The spread of the other activities also seemed reasonable since there were few cases of excessive time or delay with the exception of "Talking about the Job" (10.52%) which seemed unduly high. The implication is that it might be profitable in this type of work to ensure more detailed preliminary instruction and information in order to reduce the amount of discussion necessary during operations, but more detailed investigation would be required to substantiate this point.

The position regarding apprentices (see Appendix 39) was much less satisfactory. Only about half of the apprentices' time was gainfully employed and the fact that the apprentices were non-productive for so long would seem to merit the serious attention of management, particularly on a site where the work was considered to be very well organised. Only about 30% of the apprentices' time was spent on the basic operations - "Fixing and Erecting Materials" and "Positioning and / or Plumbing Materials" - as against 50% for the joiners and apprentices together. If the apprentices' readings (Appendix 39) are abstracted from the joint readings (Appendix 38), the disparity between the joiners and apprentices will be shown to be even more pronounced. An "Absence from the Job Position" of 15.85% for apprentices against 5.17% for joiners and apprentices also indicates a serious position. (The observer taking the readings stated that much of this absence was due to apprentices having to collect materials from the central stores and other parts of the site.)

Since 6.15% of the apprentices' time was spent watching the tradesmen at work this raises, among other things, the question of the attitude of the tradesmen to the apprentices. In this instance, as the workers were employed on a bonus scheme, the first incentive was to do the job as quickly as possible and the apprentice's speed was more important to the tradesman than his training in the skills of the trade. The apprentices were in fact being paid, in addition to their basic rates, a percentage of the journeyman's bonus payment. We are faced here with the rival claims of productivity and training.

The apprentices' activities were different when working with different tradesmen. For example, during the time when the Appendix 12 readings were taken, and Operative No. 4 (apprentice) was working with Operative No. 3 (tradesman), he was employed approximately 57% of the time on "Fixing and Erecting Materials" and "Positioning and / or Plumbing Materials". When the remainder of the readings were taken for Appendix 37, Operative No. 4 was employed with a different tradesman, and on this occasion (subtract Appendix 12 readings from Appendix 37 readings) Operative No. 4 spent about 24% of his time on the two major operations. Most of the remainder of the apprentice's time was spent "Talking about the Job", "Absent from the Job" (mainly collecting material) and "Watching the Tradesman Working". By deducting the readings of Appendix 12 from those at Appendix 37, we see that the apprentice spent a total of 34.5% of his time on these three operations - against 10.7% (Appendix 12) when he was working with the other tradesman. Similarly Operative No. 15 (apprentice) spent 50% of his time on the two major operations when working with one tradesman, Operative No. 14 (Appendix 12), but for the rest of the time, when employed with a different tradesman (deduct Appendix 12 readings from those of Appendix 37), he spent only 32.7% of his time on the major operations. The three operations/

operations "Talking about the Job", "Absent from the Job" and "Watching the Tradesmen Working" again accounted for most of the difference. These findings suggest that the joiners might be given more detailed instruction about the nature of the work and the constructive supervision, encouragement and use of apprentices.

Other points of note were these. The apprentices spent less time talking about the job than the tradesmen (7.3% against 10.52% for both joiners and apprentices) but since they were less involved in decision-making this was to be expected. The apprentices spent more time "Moving Materials" (4.3% against 1.36% for both joiners and spprentices) but again in their subsidiary role this was to be anticipated. The apprentices also spent more time "Moving to the Next Job" (3% against 1.27% for joiners and apprentices); this inferred in most cases that the tradesmen merely walked to the next place of operation while the apprentices carried all the necessary tools.

During the month of January, when severe weather conditions had been persisting for some time, one of the floors which had been poured collapsed due to the removal of some of the "Accro" props before the concrete was properly set. This may have been partly due to the exceptionally severe weather but it would also suggest that in the drive for productivity proper regard must be given to minimum standards of workmanship, both from the short-term and long-term points of view. Apprentices are likely to accept standards which they find to be established in practice and management must therefore balance effectively the needs of production, safety, quality standards and training; when a floor collapses it may be assumed that these conflicting claims have not been satisfactorily equated. The high percentage of casual labour in the construction industry is an additional reason not only for setting but for ensuring observance of

minimum/

minimum quality standards.

The relationship of work experience to the sub-group, the sub-industry, the range of work practised in the particular firm, and the actual work assignment of the individual has already been mentioned (see page 27). An idea of the possible varieties in carpentry and joinery work can be obtained by a study of the building classifications given at Appendix 40. Clearly, no single organisation is likely to provide this variety of work and even if it did the likelihood of a carpentry and joinery trainee being exposed systematically to all the carpentry and joinery aspects before the completion of his apprenticeship is even more utopian. The apprentice's practical experience is in fact doubly restricted; the possible framework is the range of carpentry and joinery work within the firm and the actual framework is the work experience that he is indeed given within this possible framework, as determined among other things by the firm's apprenticeship policy and the attitudes adopted towards the apprentice by other employees.

Since the nature of carpentry and joinery work varies according to the type of building involved, the methods employed, and other factors, the technique of activity analysis might profitably be extended over all the main categories of joinery work. It would then be possible to analyse the results with a view to establishing the basic techniques actually employed in all kinds of carpentry and joinery work. This information would be useful in many ways; so far as training is concerned, the techniques uncovered could then be considered in relation to their desirability, their frequency, and other factors such as the developing trends in the industry and the importance of gearing education and training in carpentry and joinery more closely to the emerging needs of the construction industry and the economy generally.

III SUPPORTING ENQUIRIES

i) Prestige Ratings of Industries and Occupations : Analysis of Results

The questionnaires which were designed to assess the vocational "climate" within which job choice took place and which were distributed to 70 school-leavers and 229 others (see Appendices 13 and 14) were analysed and the results are given at Appendix 14 (c), Tables 1 to 6.

The evidence suggests a correlation between liking for school subjects and "usefulness" rating of school subjects in relation to job wanted. School subject ratings tended to follow a descending hierarchy from useful "tool" subjects which were rated high to "academic" and "aesthetic" subjects which were rated low.

Engineering appeared as the popular choice with 15 year old boys of average ability and a technical bent. Also, when other groups were included (mostly but not exclusively with a technical and practical bent) the prestige ratings for industries seemed to be fairly consistent irrespective of the population group doing the rating. The hierarchy tended to run from high ratings for light engineering skills down to low ratings for heavy manual skills requiring physical effort, and low ratings too for semi-skilled sales and service work.

There seemed to be some general agreement among different groups about the prestige hierarchy of the building crafts. This hierarchy ranged from light clean work down to semi-skilled heavy work or work under exposure (e.g. roof tiler). Only with the school pupils was the heating and ventilating engineer rated top among the building skills listed, perhaps because of the prestige word "engineer". The prestige ratings for specialist operatives in the building industry did not, from the slender evidence available, suggest any particular pattern. The prestige hier-

archy/

archy for the other outdoor operatives in the building industry seemed to be fairly well established, ranging from posts of responsibility or specialist skills down to rough labouring work.

The prestige ratings for engineering work ranged from high ratings for highly skilled light engineering with very small assembly components, down to heavy work including heavy production. The prestige ratings for electrical work seemed to follow a similar pattern from small / light to heavy work.

ii) Factual information from Youth Employment Service Records

The analyses made of the Youth Employment Service records during the visits on 3.3.66 and 9.3.66 have already been mentioned, the details being given at Appendices 15, 16, 17 (a), 17 (b) and 17 (c). By combining and summarising the information contained in these Appendices we obtain the following results.

Findings

a) Extent of YEOs agreement with school-leavers' job choice

Areas X and Y (100 Boys)

	Area X	Area Y	Percentage
Agreement	41	39	80%
Disagreement	9	11	20%
Total	50	50	100%

b)/

b) Extent to which school-leavers entered jobs they wanted

	Area X	Area Y	Percentage
Same	21	14	35%
Different	29	36	65%
Total	50	50	100%

c) Extent to which school-leavers entered jobs at the same, higher, or lower skill level than the job they wanted

	Area X	Area Y	Percentage
0 (Same)	32	27	59%
+ (Higher)	2	2	4%
- (Lower)	16	21	37%
Total	50	50	100%

d) Summary of all vacancies for boys on Youth Employment Registers. Areas X and Y on 9.3.66 and 3.3.66 respectively

Type of Vacancy	Area X	Area Y	Total	Percentage
Skilled	23	24	47	42.3%
Semi and Unskilled	28	36	64	57.7%
Total	51	60	111	100%

Comments/

Comments on Findings

The evidence suggested a number of tendencies in respect of 15 year old boys leaving school in the two associated areas. The Youth Employment Officer was likely to agree with the boy's job choice four times out of five but only one boy in three would enter the job he wanted. Very few boys would enter jobs at a higher skill level than the job they had in mind; more than a third of the boys were likely to go into jobs at a lower skill level than that of the job they wanted. If the March, 1966, vacancy registers were typical, the Youth Employment Service, like the Employment Exchanges of the Department of Employment and Productivity, would tend to accumulate a large percentage of low skill vacancies.

Discussions with the Youth Employment Officers and school-leavers indicated that a more rigorous system of work classification was needed, since the degree of skill and training involved under the same nebulous job label (fitter, joiner, engineer, trainee, etc.) varied considerably from firm to firm. A related problem was that of distinguishing between the demands of industry and the needs of industry.

There would appear to be a wish pattern and a reality pattern in the vocational guidance given by the Youth Employment Service which might be illustrated diagrammatically thus :-

School-leaver's Wish Pattern	YEO's Wish Pattern	The Reality Pattern
i.e.	i.e.	i.e.
Job Wanted	Job Recommended	Job Entered

The Economic Vacuum	The Economic Reality

Certainly the vocational guidance given within the framework of the local employment situation, however meritorious conceptually, was in practice restrictive of opportunity. It was indeed apparent that the

present/

present parochial concept of entry into employment at a moment in time (often inopportune in relation to the state of the labour market) required to be replaced by a grand strategy on a broad geographical front related to the needs of the economy and the proven aptitudes, needs and appropriate motivation of the individual phased through a period of time. The Youth Employment Service "betterment" register (containing particulars of young persons to be notified, when the occasion arose, of "better" vacancies more suited to their ability and interests) and the Department of Employment and Productivity system of notifying employment opportunities at fixed times throughout an extended area by telephone link-up of Employment Exchanges, were useful arrangements but of a tactical rather than strategic nature. The real need seemed to be for a sophisticated system of education and manpower planning, incorporating many other agencies and disciplinary techniques besides those of the Youth Employment Service and based on regional and not just local resources.

In brief, the superficial concept of a once-for-all event, involving job choice and entry into employment, would need to be replaced by the more fundamental concept of the continuous development through time of our human resources.

iii) Comparison of Craft Level Findings with Investigations at Higher Technological Level

The questionnaires completed by the former Heriot-Watt students - 34 part-time Higher National Certificate students (see Appendix 18) and 40 full-time Diploma and Associateship students (see Appendix 19) - were analysed and the results are set out at Appendix 41. The pattern of these results is strikingly similar to those we have already established at craft level.

Students/

Students were inclined to rate the importance of subjects in relation to subsequent experience in industry, for example those who became site agents stressed the importance of more practical preparation for the site agent's work while those who became quantity surveyors emphasised the importance of those subjects which gave good practical preparation for the quantity surveyor. Thus recommendations were made for more, less or the same amount of teaching for each subject depending upon the particular student's post-college industrial experience. In short, the assessment of usefulness of subjects by technologists paralleled the assessment made by the craft students - judgement was made on the basis of relevance to subsequent (or anticipated) working life activities.

As with the craft workers, there was a wide spread in the age of both full-time and part-time building technology students at each stage of their studies; the technologists also seemed to change employer after a few years and usually for the same declared reason as the craft workers - to gain experience. An interesting proportion of day-release building technology students, i.e. students actually working, were apparently motived to change jobs for financial reasons; seasonal employment and considerable use of incentive schemes in the construction industry may have been important contributory factors in this financial motivation. Like the craftsmen, the technologists seemed to have to rely upon a high degree of individual initiative when entering employment or seeking more experience and opportunity.

Students' recommendations about the types of practical experience to seek or avoid at different stages in training were also coloured by their background. As one student put it : "A student with a purely scholastic training should seek practical site work before and while at college. A tradesman with a practical background would be advised to seek more prac-

tical/

tical experience but also office and supervisory experience. It is, however, extremely hard to obtain suitable vacational employment". No doubt, any vacational employment offered would tend to be weighted in favour of the firm's economic requirements rather than in the direction of individual development.

The point was also generally made by former building technology students that the experience to be sought depended greatly on the type of career the student had in mind. Some stated that this could be done by moving around from firm to firm, a practice certainly implemented by many students, as already noted. It was also emphasised by many students that experience had to be purposeful. "Avoid being used as a message boy or on a job where you are involved in one aspect only."

Some building technologists recommended more vocational guidance including detailed information about career prospects in the construction industry before leaving college; others maintained that post-graduate industrial experience was essential to help the student crystallise his ideas on career prospects intelligently.

Thus, for the technologists, as for the craftsmen, "experience" was a euphemism for fortuitous industrial exposure. With each firm emphasising its own priorities and with an absence of planned manpower deployment and training within the economy, considerable individual initiative and enterprise was necessary for systematic individual development.

IV SUMMARY OF FINDINGS

In Part I of this thesis an account has been given of an investigation into the process of training for skill and the results of this investigation have been presented and discussed. Since the experimental work embraced a number of separate enquiries, each of which produced its own complexity of results, the findings are restructured below in such a way as to focus more clearly their relationship to the purpose of the enquiry, namely the trends in industrial training and related activities. The evidence suggests the following trends :-

Industrial Training

1. The training of craft apprentices by firms, far from being systematic, thorough and comprehensive, is haphazard, repetitive and narrow.

2. The City and Guilds of London Institute training syllabus is a theoretical ideal; in practice, neither tradesmen nor apprentices cover more than a fraction of the full list of operations.

3. Continued experience does not guarantee widening of experience, even the tradesmen showing knowledge of only a fraction of the operational activities of their craft.

4. The range of operative skills learned by apprentices and tradesmen is determined, not by systematically organised controlled experience, but by chance exposure which reflects the production needs and activities of the firm at particular moments in time; no firm gives evidence of comprehensive training in the full range of approved City and Guilds operations, and on-the-job training is clearly secondary to the economics of production.

5. Lack of experience among older apprentices and tradesmen is not just confined to the more advanced operations but includes many elementary operations.

6./

6. Blanketed under one craft title are various types of sub-groups of workers practicing this or that particular range of skills according to the nature of the work and the work methods employed by the individual firm.

7. Each industry (i.e. construction and engineering) is in fact an aggregation of a number of industries or sub-industries comprising firms of varying sizes and activities; work experience is related not to the craft label or job title but to geographical location (i.e. the particular firm) and to job assignment (i.e. the particular tasks assigned to the individual).

(Other influential factors, of course, include the technology being applied, managerial and trade union philosophy, and the traditions and customs of the trade.)

8. The possible range and variety of work in any one craft is so great that there is little possibility of finding it in any one firm; it is even less likely that any one individual would encounter it all.

9. Many tradesmen and apprentices change firms, the commonest reason given for such movement being restricted experience and prospects in the job being left. Changing of occupational skill is less frequent than changing of firms.

10. The apprentices and tradesmen with the widest range of operative skills are in general those who have been most mobile, not only between firms but between industries; breadth of training is very much dependent upon the initiative, mobility and ambition of the individual worker.

11. In better than average working conditions in the construction industry, the apprentice is gainfully employed for only about half of the working time; much of this "gainful employment" appears to have little positive, and sometimes even negative value from the point of view of education and training.

12. Technicians and technologists who may have to supervise craft workers, or whose activities imply craft knowledge, show limited familiarity with the craft work involved.

Related Further Education and Training

13. Related instruction at Further Education Centres throughout the central belt of Scotland, like experience in industry, is restricted and uneven and as the students advance in their courses the trend is towards repetition, with broadening out being only marginal.

14. An additional reason for differences in instruction is the variation in industrial practice from one local area to another.

15. The City and Guilds "basic assumption that courses are intended normally to supplement industrial experience" (see Appendix 1) faces the practical difficulty that such experience varies widely from firm to firm and individual to individual. "Explanations of the reasons underlying the daily work of students" (Appendix 1) may often take place in an intellectual vacuum because the student has not in fact encountered the operation at work.

16. Because of the students' wide variation in practical experience it is equally difficult for technical colleges to decide on

"those/

"those operations which are seen less frequently in normal daily employment" (Appendix 1).

17. The growth points in the practical application of new technology are perforce the more progressive industrial organisations and there is an obvious time lag between the introduction of new techniques in industry and complementary instruction in the technical colleges; new technology is the enemy not only of job structure but of established technical instruction.

18. There is a wide spread of age (3 to 5 years being not abnormal) among students in the same class of the same course.

19. There appears to be a pronounced drop-out of craft students at the end of the third year of day release courses.

20. Employers' attitudes to continued day release beyond the age of 18 or beyond the third year of the City and Guilds Course may vary but apart from this the greater the immediate financial loss entailed by the student through attendance at day release classes, the less likely is it that he will continue to attend classes.

21. Proportionately more engineering than construction industry trainees continue their studies beyond the third year; this may be related not only to the greater financial sacrifice among construction industry students attending classes but also to the emphasis on qualifications in engineering as against being "time-served" in the construction industry.

The Vocational Climate and Job Choice

22. Potential craft apprentices tend to rate high (both from the point of view of liking and subsequent usefulness) those school subjects which to them have obvious vocational implications; conversely they tend to dislike "academic" and aesthetic subjects which in their eyes have little practical value.

23. Prestige ratings for different industries and occupations show remarkably consistent trends, whether the ratings are made by school-leavers, craft apprentices, tradesmen, technologists or other industrial employees. Engineering is the number one prestige industry and associated engineering occupations are rated correspondingly high; within the engineering sub-groups, the prestige ratings range from electronics at the top through the various light electrical and mechanical sectors to rough, heavy unsophicated work at the bottom.

24. According to their own evidence, most apprentices find their apprenticeships through their own initiative or that of a friend or relative.

25. Where the Youth Employment Service is unable to obtain for the potential craft apprentice the type of work he is seeking, the tendency is for the Service to be able to offer him only stop-gap or lower skilled work.

26. Under existing arrangements the Youth Employment Service is run on a restricted parochial basis and job-choice for school-leavers is correspondingly parochial.

Craftsmen and Technologists

27. The findings in respect of technologists are similar to those obtained for the craft workers. Practical training and vacational employment are weighted by the firm in favour of its own requirements rather than in the direction of individual development. Since each firm varies in size, objectives, managerial and supervisory skill, organisational pattern, resources, range of work, rate of technological innovation, atmosphere, customs and practices, and in many other ways, it naturally emphasises its own priorities within this highly individualistic set-up. Thus, in the absence of any overall national strategy for the systematic development of our human resources, a premium is placed upon individual initiative and enterprise, as much for the aspiring technologist as for the craft worker.

PART TWO

TOWARDS A NEW CONCEPT

OF

INDUSTRIAL TRAINING

CHAPTER THREE

OUR PRESENT DIFFICULTIES HAVE HISTORICAL ORIGINS

The Existing System is Inefficient

If we accept that the main task of industrial training is to develop the nation's human talents within the framework of our economic needs and social aspirations, the evidence assembled in Part I of this thesis gives cause for concern. Under present arrangements, the main training effort is concentrated at the level of the individual enterprise and the economic objectives of the undertaking inevitably override broader national objectives. The historical division of the crafts, the range and type of work available at a moment in time in a restricted parochial area when a boy leaves school, the artificial age barriers associated with training for so many skills, the absence of effective methods of measuring the extent and quality of training, and the pronounced variation in related instruction offered from college to college, all mean that training for skill in this country is dangerously fragmented, overspecialised, and individually restrictive, in an age of rapid technical change.

"It is estimated", states the Ministry of Labour Gazette (5), "that more than eight million changes of employer occur in Great Britain every year ... Preliminary information from the occupational and mobility section of the draft report of the Labour Mobility Survey carried out by the Central Office of Information, shows that 57 per cent of those who had been in the labour force in the 10 years covered by the survey had remained in the same job... Only 44 per cent of those who had first started to

work/

(5) Ministry of Labour Gazette, July 1967, "Mobility between Industries and Jobs", page 379.

work in the period remained in the same job. This confirms that the under 25's change jobs more often than the average ... More than 10 per cent of all jobs were held for less than three months, 37 per cent for less than a year, and almost two-thirds for less than three years. One in three skilled manual jobs were held for less than a year". Clearly, industrial mobility is accelerating and the young person whose training has been restricted to certain selected operations within the skill requirements of one firm is likely to be inadequately equipped to sustain the skill requirements of others. The urgent need for redeployment stressed by the Government, i.e. getting people out of jobs where they are not required, into jobs where they are required in terms of the economy, depends, among other things, upon the ability of the individual worker to fit into the pattern of skill needs at any given time and this in turn depends upon the efficiency, breadth and relevance of previous education and training. The more limited the experience and range of skills offered, the more difficult is it likely to be to bridge the gap between what the individual has been doing before and what he must do now.

The present system is therefore inefficient and falls far short of our strategic requirements; the individual trainee is denied the opportunity of developing his potential through more varied work and instruction, and the economy suffers from this failure to breed the degree of flexibility of skill and intensity of training necessary for good workmanship, productivity and adaptability to change.

How did this situation arise ? To answer this question adequately we must take as our starting point the historical roots of our present apprenticeship system - the mediaeval guilds.

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The Legacy of the Past

- The Mediaeval Gilds

Business from the 12th to the 17th Century was for the most part conducted within the gild system, gild regulation of trade beginning with the growth of towns. The mediaeval town economy was guided by the principle of the self-contained unit; everything possible should be produced within the town or its environs and sold directly by the producer devoid of any procedures likely to enhance the price, while goods brought into the town should be offered in the open market and sold in gross, not by retail. The town authorities were interested in ensuring an adequate supply of goods of reasonable quality and price to meet the demand and their regulations in respect of gilds were designed to that effect; they supported merchant gild and craft gild so long as they considered that it was in their interests to do so. The merchant gilds and craft gilds also issued ordinances designed partly to protect the public from poor quality, high prices, and sharp practices, and partly to enforce their monopolistic rights in their own particular spheres of activity with a view to making such profit as they could within a rigidly controlled economy. In this way the gilds became part of the machinery of government in the mediaeval towns.

The craft gilds claimed and obtained more or less exclusive jurisdiction over the crafts within the town limits on the grounds that such jurisdiction was a prerequisite to the enforcement of the agreed standards of practice, quality and price; they issued seals, inspected weights, supervised apprenticeships, excluded "foreigners" (i.e. those from outside the town), limited the number of craftsmen, compelled members of crafts to accept common standards of quality, and increased as they could, within

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the strong conventional pressures of a tightly controlled economy, the possibilities of profit. Most gildsmen made or processed goods with their own hands and offered them for sale in their shops (i.e. workshops) or at the weekly fair of the town, and most craftsmen maintained one or two apprentices who gave cheap labour in return for instruction in the mysteries of the craft.

Just because people thought in terms of a rather static society in which the individual was born into a particular way of life, it must not be imagined that there was anything particularly idyllic in the arrangements. Although they conceded in principle monopolistic rights to the various gilds within the town limits, the borough officials had to ensure that the gilds did not press their own economic advantage too much to the detriment of the general interest and, where they saw fit, from time to time they took measures against the gilds; this task of preserving the balance of interest had to be incessantly fought. Merchant gild fought merchant gild, craft gild fought craft gild, merchant gild fought craft gild. Dealers in cloth (mercers, tailors, drapers) sought their own advantage against each other and against the cloth processors (weavers, fullers, dyers, shearers) who were also constantly at loggerheads among themselves, and with all the other trades and crafts the position was similar. There were disputes among craftsmen in wood (joiners, carpenters, coopers, pattern-makers, bowyers, fletchers, etc.) among metal workers (goldsmiths, blacksmiths, armourers, braziers, gunmakers, marshals, farriers, cutlers and others), among trowel trades (such as bricklayers, tilers, wallers, plasterers and pavers), among the leather workers (including tanners, skinners, cordwainers, curriers, shoemakers, cobblers, glovers, pursers, pointers, saddlers, pouchmakers, lorimers, girdlers, bottle-makers), among those concerned with food (bakers, brewers, butchers,

confectioners/

confectioners, salters, vintners, and innholders, to mention some) and so on.

The historical evidence[x] makes it clear that for a dispute to occur it required only that one person or group should have to deal with another. Every possible permutation of rivalry existed - haberdashers against merchant tailors, cordwainers against tanners, bowyers against fletchers, cobblers against shoemakers, dyers against weavers, bakers against brewers, joiners against carvers, and so we could go on. Saddlers opposed joiners, painters or lorimers if they sold merchandise pertaining to the saddler's craft to anyone but saddlers; glovers bought and sold leather and made points; pointmakers made gloves; fullers and shearmen wove cloth; dyers did shearing and fulling; carpenters did joinery and joiners did carpentry work; bricklayers did carpentry, plumbers did tiling, and masons, slaters, tilers and plumbers worked at bricklaying or plastering; bakers brewed and brewers baked; butchers dealt in wool, tanned hides, handled skins, tallow and candles, and cooked; tailors, shoemakers and many others bought and sold as merchants in their houses and shops; blacksmiths tried to control clockmakers who tried in turn to control spectacle-makers. One man often practised several callings; a Chester tradesman, for instance, was an ironmonger, vintner, mercer, and retailer but he took time out to quarrel with someone who dared to practice as a retail draper. Various craft and merchant combinations fought for advantage over similar combinations.

Sectional interests have always existed throughout history and mediaeval times were clearly no exception. The general interest, however, is related to the size of the socio-economic and political unit, and although this unit was/

x See for instance Wm. F. Kahl: "The Development of the London Livery Company (6) and Stella Kremer: "The English Craft Gilds" (7) who have supplied the writer with most of his examples.

was at first the town which over-ruled the merchant and craft gild whenever necessary, the gradual unification of the state brought into play the national interest as represented by the government, and just as the town over-ruled the gild, so the state over-ruled the town. The struggles of the crafts were thus intermingled with the struggles of the town and the state; statute law, common law, and the town by-laws reflected the ebb and flow of circumstances, opinions, pressures and emergencies.

Gild control, fairly powerful in the 15th and 16th Centuries, weakened seriously in the 17th Century. The towns had always admitted a limited number of outsiders to town privileges for various reasons, for instance when they needed money and the outsiders could afford to buy their privileges, or when they were short of certain kinds of labour, or as a method of bringing a recalcitrant gild to terms. The state played an increasingly important part in encouraging the development of the economy regardless of gild objectives. And the gilds themselves also admitted strangers on payment when they needed money. All these practices intensified as business grew.

- The Division of Labour

Thus state, town, and the gilds themselves, in varying degrees helped to break up a system based on a relatively static concept of the division of labour. As industry and commerce developed it became increasingly impossible to keep all the different activities rigidly separated. The division of labour was supported as an insurance of high quality, good efficient output, and as a means of avoiding price rings, but in its static aspect it hampered the expansion of production and indeed had never been consistently applied. For example, as early as 1321 the cloth trade had become so important to the economy of the City of London that the Court of Hustings set aside the exclusive rights of the weavers by declaring it law-

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for all freemen to set up looms and to sell cloth as long as the King received his yearly farm. But, to take another example at random, in 1393 the bakers of white bread were ordered to bake no black and vice versa. Through the centuries, neither the towns nor the state were entirely consistent in applying the division of labour and its concomitant monopoly of particular activities.

The gilds themselves were inconsistent. Each group that obtained its independence of another was quick to deny a similar privilege to any growing faction within its ranks, however logical the case. Thus the apothecaries, having won their independence from the grocers, shortly thereafter resisted vigorously a similar attempt by the distillers to establish independence from them. During the whole of the 17th Century disputes raged between the carpenters and joiners of Newcastle. The carpenters worded their arguments in this way; when a craft which had once been a recognised branch of another, as was joinery to the carpenter's craft, made of themselves a voluntary separation from that craft and their election to be a separate craft, they thereby by their own act restrained themselves to that occupation and so lost their privilege wholly as to the craft from which they separated themselves. Yet, continued the carpenters, by their act the other crafts are not nor cannot in reason be barred from their inherent right and privilege of using both occupations if in truth and law they were really to be accounted several trades and occupations. This was the same argument which had been employed in the 14th Century by the cordwainers of Shrewsbury when they refused to stop tanning, and the cordwainers could no doubt claim an historic right to tanning. This was one of the inherent difficulties of the situation; as the division of labour intensified through the ages and new more specialised groups set up, they could exercise their monopoly only by having other groups res-

trained/

trained from activities which, in many instances, they had been practicing by custom.

In the 15th Century necessity drove various craft gilds into amalgamation, the combinations tending at first to be among crafts using similar material. Thus in 1439 the fullers were invited to join the weavers' gild in Oxford - when there were only two freemen weavers left in Oxford ! And in 1563 the Lincoln glovers and skinners admitted girdlers, pinners, pointers, scriveners and parchment-makers into their organisation. But as things grew worse, crafts of any kind were prepared to unite with any other crafts if they thought it would help their desperate position. This explains such curious amalgamations as that at Chester in 1649 of painters, glaziers, embroiderers and stationers.

Gild supervisors or searchers had from early times been employed to make sure that goods were made in accordance with gild standards, that the master's workshop was satisfactory, that weights and measures were true, that stocks were purchased according to agreed procedures, that suitable apprentices were recruited and properly enrolled, that apprentices who had served their full apprenticeship were fit to set up on their own, and so on. Defective goods were seized, shops were shut if the "master" was not properly time-served, and other appropriate actions taken as circumstances dictated. Supervision too had caused trouble from the start; supervisors were bribed, refused entry to workshops, and even on occasion assaulted. But at the height of their powers the gilds had been able to enforce their rights of supervision and search fairly well. Now as their powers steadily declined they became less and less able to enforce their supervision of trade and industry and the laws governing apprenticeship. In any case, as industry grew more complex, gilds multiplied so rapidly in practically every branch of industry in most areas that it became quite

impossible/

impossible to keep related crafts confined to their own particular sphere. Furthermore, the price revolution of the 16th Century and the advent of the factory system, weakened still more the power of the gilds over craftsmen and merchants and during the revolutionary period from 1789 to 1848, the gilds gradually disappeared. They were abolished in France in 1791 and when Republican France conquered Belgium and Holland they disappeared there too; they came to an end in Spain and Portugal in 1830-40 and in Italy in 1864. In Great Britain some of the more important gilds survived as fraternal and charitable institutions.

- The Mediaeval Apprentice

To become a freeman and a member of a craft gild, a man was expected to serve a seven years' apprenticeship but even as early as the 14th Century this system was being abused not only by masters, who took on more apprentices than was their right or did not enforce the full seven years, but by the craft gilds themselves, since the son of every freeman had the right to the freedom of his father even though he had never learned his father's trade. In order to replenish the needy gild exchequer, the custom also grew of admitting to membership of the gild by redemption, i.e. payment of a fee, persons who had no real connection with the particular trade or industry. Nevertheless, the seven years' apprenticeship was the main route to craftsmanship and it is important to consider what was involved.

Let us take the example of an apprentice in London in the time of Queen Elizabeth. * London was no bigger than Brighton is to-day and the shops and houses were pressed closely together, built of oak which was then plentiful and cheap, the wooden frames being filled in with wattle and plaster. The narrow cobble streets were crowded with horses, coaches and carts/

* Source: "Living in Other Times - Thomas the Apprentice", Hulton Educational Publications, 1958 (8).

carts. The London apprentice had to wear a blue gown in winter and a blue cloak in summer, together with breeches of white broadcloth, and during his seven years he had to live with his master's family and work hard not only in the workshop but also in the home. Outside his master's shop (or workshop) was a sign to show his business - a saddle, a shoe, a pair of spectacles, and so on, as the case might be - and the apprentice would help to attract people to buy the wares made in the shop. At mealtimes he would eat with the family and he would help to serve at table and wash up afterwards. When he had an afternoon free from work he would join other apprentices outside the city gates in the open fields and play games.

At the end of the day the apprentice would help to shut the shop by fixing the stout wooden shutters and bolting the door, and in the evening he might join the master and his family in playing music and dancing. When the family retired to bed, a large oak four-poster with legs perhaps a foot square, the apprentices (there were sometimes more than one in the home) would go to the workshop where they each slept on a mattress. Like everyone else the apprentice had to go to church on Sundays or be fined by the church wardens, the morning service beginning at eight o'clock; after the service, the apprentice would have to stay behind to learn his catechism until he knew the answers by heart. On some days the apprentice, perhaps along with the master's own children, might spend a few hours learning reading, writing, and arithmetic in one of the Dame schools, i.e. a school of a not very high standard run for the poorer children by a woman called a Dame.

When the apprentice had served his seven years and successfully completed his masterpiece, he became a journeyman, eligible to journey anywhere each journee or day to work for any master craftsman of his craft at a journeyman's rate of pay until perhaps within a year or two he

became/

became a master himself.

- The Legacy To-day

What does this brief picture tell us ? It makes clear that the mediaeval apprenticeship embraced not just the learning of a craft but an integrated pattern of living; it is important, in examining the implications of the system, not to mistake a part, the activity in the workshop, for the whole, a complete way of life. Herein lies the secret of the success of the system; in a peasant society, where the mass of the people were illiterate, the talents of those fortunate enough to enter the ranks of apprenticeship were not allowed to atrophy. Apprenticeship training embraced not just instruction in the mysteries of a particular craft but systematic development within a whole cultural tradition. The end product of becoming a free (liber) burgess, as we have seen, was to enter a privileged class; freedom, in fact, was equated with privilege, monopoly and restriction. Some of this mystique of "apprenticeship" lingers on to-day. The school-leaver of average ability is aware that apprenticeship is a restricted privilege, guaranteeing - so he thinks - systematic training and development towards an assured future in the practice of an interesting and essential craft. It becomes important, therefore, to "get an apprenticeship", the limitations of which are only gradually uncovered through years of restricted opportunity and experience.

Our glance into the historical past also makes us conscious of the enduring struggle through the ages of group against group, vested interest against vested interest, argument against argument, rationalisation against rationalisation, and of the fact that there is nothing really new in the problem of trying to foster the general interest in industrial life against restrictive practices, misleading arguments, shortages of particular skills

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and surpluses of others, unenlightened attitudes, sharp practices, and a stubborn determination to indulge the appetite now in the short-term rather than exercise the foresight, goodwill and self-discipline which lead to more lasting gains in the long-term. Among the new ingredients in the situation to-day, apart from the growth of democracy, is the infinitely more rapid development and application of scientific and technological knowledge resulting in problems presenting themselves more suddenly, more unexpectedly, more acutely, and requiring solution within a drastically reduced time-span. The House of Commons which had prohibited the use of the gig-mill in the 16th Century refused in the 18th Century even to receive a petition against the introduction of the spinning-jenny, but to-day, as a matter of survival, the climate of opinion must be changed not in terms of centuries but in terms of years. What is being done to-day in this connection?

We may usefully condense the main recommendations of government-sponsored enquiries relating to training for skill (see Appendix 42) between the years 1956 and 1965. The enquiries selected cover technical education, the supply and training of teachers, recruitment and training of young workers in industry, further education and commerce, industrial training, the growth of the economy, and the education and further education of young persons of less than average ability. So far as they relate to the problem under investigation, the proposals contained in these publications may be conveniently summarised as follows :-

Young Persons

Teach boys and girls to be adaptable, have flexibility of outlook, versatility of skill, and to regard change as normal. Give them guidance - as pupils and later as students - in the development of personal attitudes and standards, and give them also "sound vocational guidance".

The Technical Colleges and the Day Schools

Dovetail syllabuses and assimilate teaching procedures in schools and colleges, since education is a continuous process. Give the colleges better information about pupils from school and phase college admission dates (for day-release, etc.) to accommodate not just the pupils who leave school at the summer but also those who leave at other times of the year. The colleges should approach employers regarding a) the possibility of switching evening-only students to day-release classes and b) continued day-release for students beyond the age of 18 years. Liaison between the colleges and the Youth Employment Service should be strengthened.

Co-operation between Technical Colleges and Industry

There should be more co-operation between industry and technical colleges including arrangements for visiting staff from industry and government departments to come to the colleges, the return of college staff to industry and commerce to refresh their experience, and consultancy work by college staff. There should be development work in relation to courses for boys and girls who receive little educational training through their employment "and do not require specifically vocational training".

Training

There should be better recruitment techniques in industry and more flexibility regarding the maximum age of entry into recognised schemes of training, including apprenticeship. There should be further education for all employees, not just some, and facilities for all forms of further education - day-release, block release, sandwich courses, full-time courses - should be increased, with evening classes and correspondence courses,

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where they exist, playing generally a supplementary and not a basic role.

Arrangements should be co-ordinated for keeping all concerned up-to-date and for ensuring that the needs of education and training are met as far as possible in advance of change and not after it has taken place.

The severely restricted employment opportunities for girls must be overcome by offering them opportunities in many occupations for which they are suited but which at present are closed to them; similarly the main weight of further education instruction for girls should be transferred from evening classes to full-time and part-time day classes.

Organised and extensive arrangements must be made for the retraining of people of all ages whose skills are becoming obsolescent or are already no longer required.

These recommendations represented fragmented tactical attacks upon different aspects of one problem, namely the effective development of the nation's human potential to meet the needs of a changing economy in an age of aggressive business competition and rapid scientific and technological innovation. More important than the tactics, of course, is the overall strategy, and in the Industrial Training Act of 1964 and the National Plan of 1965 we see the tentative beginnings of an attempt to systematise the arrangements for identifying and cultivating the talents of the nation in relation to our industrial requirements.

Industrial training is, in fact, only part of the wider strategy of economic growth. If, as we must, we are to cast aside the present system of training and replace it with a more efficient one, we must do so within this wider strategy of national purpose so that industrial training will fit intelligently into the overall pattern. This is the problem which will now be examined.

CHAPTER FOUR

THE STRATEGY OF NATIONAL DEVELOPMENT

Government Strategy

We have seen that the roots of our present apprenticeship system stretch back to the Middle Ages when apprenticeship was a way of life woven into the fabric of a less complex community. By contrast, the modern apprenticeship is part of an industrial training system which operates within the framework of a highly sophisticated technological society. This industrial training is concerned with the development of our human resources, not just as a matter of social and political morality but as an essential aspect of the implementation of our national aspirations.

The modern democracy seeks economic growth within the framework of a free society and a policy of relatively full employment. Government policy serves as a guide to the nation and is intended to reinforce constructive market developments; it must spell out in detail the government's intention, provide a basis for linking the activities of the nation within a purposeful pattern, and indicate the means by which the country's selected objectives are to be achieved. The beginning of such an exercise was carried out with the publication of the National Plan (9) in September, 1965, and the purpose of the Plan is outlined in the Foreword by the (then) First Secretary of State, George Brown (see Appendix 43).

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(9) The National Plan, Cmnd. 2764, H.M.S.O., September 1965.

The commitment to both economic growth and full employment illustrates the fact that a number of government policies exist simultaneously, varying in scope and importance. There are many sectors of human endeavour in modern society - government, local government, industry and commerce, to name but three broad facets - and a bewildering complex of sub-sectors; there are many different industries, with many different problems, all at different stages of development. There are expanding and declining industries, those where rapid technological change is accompanied by rapid increases in demand resulting in no significant displacement of labour, those where much slower technological change is accompanied by slow increases in demand resulting in significant displacement of labour, and so on. The intermixture of factors involved is complicated and confusing, the agencies concerned are equally complex (government ministries, local authorities, employer and trade union groups and sub-groups, social services, etc.), and there are as many attitudes and particular problems as there are particular officials, employers, trade unions, firms, local areas, individuals. In this situation policy operates within a hierarchical structure, and if policy - and especially government policy - is to be meaningful, the social, political and economic policies at the lower levels must be consistent with those higher up.

During the 20th Century, and particularly since the end of the Second World War, the British economy has been under heavy pressure. Successive governments have highlighted the problems - the balance of payments, productivity, the export drive, a prices and incomes policy, and an appropriately trained labour force, to mention but some. Most government-sponsored enquiries in recent years related to training for skill (see Appendix 42) have underlined the broad facts, namely deficiencies/

iencies and imbalance of skills, and rigid patterns of thought and behaviour that restrict our educational and industrial achievement. We need to improve the availability, mobility and quality of our manpower. The task is urgent and requires the co-ordinated effort of all forces which can contribute effectively to its accomplishment.

The key role of industrial training in developing and equipping our manpower resources to meet the existing and latent growth needs of the economy is obvious. In the short term, it is concerned with the effective training and deployment of human resources; in the long term, it implies expansion, improvement and relevance in the skill levels of the labour force. Manpower programmes designed to reduce unemployment, to facilitate transition from declining to new industries, from contracting to expanding occupations, from labour markets of reduced opportunity to labour markets of increased opportunity, must take account of skill content and requirements, and thus industrial training is a fundamental aspect of manpower policy and planning. So too is its corollary of labour market analysis and information; we have to determine the present distribution of national manpower, the required distribution on the basis of demand (what industry asks for), and the required distribution on the basis of analysis (industry's apparent immediate and trend needs). An official start in tackling in a very general way the problem of manpower statistics and trends was, of course, made with the publication of the first report of the Manpower Research Unit of the Department of Employment and Productivity (10) in 1964; additional reports have since been published.

All social and industrial activities are inter-connected and industrial

training/

(10) Manpower Studies No. 1 : The Pattern of the Future, H.M.S.O., 1964.

training and manpower policies must be seen in their true context as part of a continuous exercise, that of developing our human resources as effectively and as fully as possible. Training is thus linked to the educational system. Only in the more restricted sense can education be regarded as a preparation for life, anticipating the tasks and problems of post-school society; in its wider sense education is the development of the human potential and as such must never be allowed to stop.

The objectives of formal schooling must be integrated with the basic objective of economic and cultural growth. The schools must know and accept the general strategy if they are to behave in the required way and fit intelligently into the required pattern. Educationists must cultivate attitudes and values, skills and knowledge, which will motivate purposeful behaviour so that the formal school system and post-school education and training are effectively linked to meet the existing and emerging demands of an advanced society. Educational planning, investment in the future in relation to existing and anticipated resources and needs, must - like all planning - be based on forecasting with built-in self-correcting feed-back processes. Just as investment to the economist means abstaining from present consumption, so to the educationist investment entails the short-term sacrifice necessary for human development in order to reap the long-term harvest of realised potential.

In an advanced culture with a rapid rate of technological innovation and changing market conditions and demands, really long-term forecasting is virtually impossible since we do not know what the nature of much of this technological innovation and market movement will be. In such circumstances, it would be impractical to gear our educational and industrial systems to produce people equipped for narrow occupational specialisations. If we cannot answer the basic question posed by training for skill - namely training for what skills ? - we must proceed on a broad front. The development of curricula for unknown future occupations must put the weight on broad, eclectic, academic accomplishment and a positive attitude towards constructive change; these are the springboards of adaptation and adjustment in a dynamic economy. This is not just a priori reasoning if we bear in mind the evidence collected in Part I; additional supporting evidence will be found in the next chapter.

To the ten years' systematic full-time formal educational system which was gradually established in the first half of the 20th Century, the Industrial Training Act of 1964 is attempting to add systematic industrial training and education. As the pace of technical and social change quickens and its complexity increases, the requirements of such education and training stretch out far beyond the conceptual limits of the apprenticeship system; to-day the explosion of knowledge, the impact of applied science, and the pursuit of ever-increased efficiency encompass the whole labour force. Individual development, adaptation to a changing environment, is a life-long process. Industrial training (and retraining) is part of an educational continuum.

If we wish to determine what the nature and role of industrial training should be in a particular society, we must remember that every nation has reached its own unique stage of development, with its own cultural heritage, its own institutions and traditions, its own prevailing practices and climate of opinion. It is within this special context that industrial training must operate and it is not therefore surprising that training arrangements - circumscribed by national peculiarities - vary considerably

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from country to country. On the other hand, if we compare the pattern of vocational training in different countries, we will detect common threads running through the multiplicity of arrangements and we will see more clearly what vocational training is really about.

For this reason, the final chapter of this thesis makes reference to vocational training arrangements in different countries throughout the world (bearing in mind the different cultural contexts within which it is practiced) within the framework of the prevailing educational and industrial systems of these countries. The evidence from these comparative studies is then integrated with the earlier findings in an attempt to develop a more sophisticated concept of the meaning and function of industrial training, with particular reference to our own society.

CHAPTER FIVE

VOCATIONAL EDUCATION AND TRAINING

We have seen that training for skill, against a background of constant technical change, is part of a lifelong process of human development, embracing both the educational and industrial systems. We will now look at vocational training from this developmental point of view, considering it in relation to technical change, the educational system, vocational guidance, the individual firm and some related aspects. Practices and studies in different countries in respect of all these facets will be cited, and the role of the Industrial Training Boards and the Central Training Council in the United Kingdom will then be evaluated.

THE INTERNATIONAL SCENE *

Technical Change

A special research unit has been set up by the Institute of Labour Research, Moscow, to assess the possible repercussions of automation and mechanisation on the structure of the labour and an account of the work of the unit is given in an article by Anatole Zvorykine (11). Methods have been developed whereby changes in the occupational structure result-

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(11) Anatole Zvorykine : Méthodes de détermination des consequences possibles de la mécanisation et de l'automatisation sur la structure de la population active. Cahiers d'étude des sociétés industrielles de l'automation, Paris, No. 7, Autorité, technologie et emploi, 1965, pp. 185-193.

* Most of the international examples are pruned from the C.I.R.F. Abstracts published by the International Labour Office, Geneva, which "constitute a selection among many thousands of articles, books, laws, decrees and other material on, or connected with, vocational training which are published each year throughout the world".

ing from technical and organisation developments influencing the quantity and quality of production can be calculated in advance, and such an exercise has been carried out in the machine-tool industry. Using as a basis the census of material resources and employment structure in 1959, and taking account of the technical development plans of the industry, a forecast was made of the occupational structure in 1970. The 300 trades which made up the industry were divided into two main groups - production workers and ancillary service workers, comprising 7 and 5 subgroups respectively. Calculations were made with the aid of appropriately devised formulae regarding changes in the volume of production, changes in the type of machine manufactured, the rise in the level of specialisation and inter-plant co-operation, modern equipment and other technical changes, the mechanisation of maintenance, and the impact of other factors influencing manpower requirements including mechanisation and automation of quality control, reduction in losses due to production faults, decrease in absenteeism and the effect on the workers of reduced working hours. For example, according to available data, the number of production workers increased in direct relation to the volume of production while the proportion of ancillary service workers increased only by 0.2%. The plan forecast a production increase of 236% for 1970 over 1959 and the change in the number of production workers was therefore calculated as $P_1 = P_o + 2.36P_o$, and the number of ancillary service workers as $P_1 = P_o + 2.36 \times 0.2 \times P_o = P_o + 0.48P_o$. Once the projected occupational structure at the end of the period was calculated, the corresponding skill structure was established with the help of a table indicating the structure prevailing in the base year. The Russians are proposing to try out this method of determining changes in occupational structures and skill levels in all sectors of industry.

The annual meeting of the Canadian Management Association in Montreal, June 1966, included a special conference on manpower policy and an abstract of the papers submitted and the subsequent panel discussion was published by J. Marchand and L. Hemsworth (12). The abstract mentioned that as a result of the recommendations of the Economic Council of Canada all federal responsibilities relating to manpower had been concentrated within the Department of Citizenship and Immigration and that the Council stated in its second annual review that the total output or income of an economy was determined by the quantity and quality of the productive factors employed - labour, capital and natural resources - and the efficiency with which they were combined to produce output and income; the most important of these three factors was the human one.

Future plans of the Department of Citizenship and Immigration covered major programmes applying fresh concepts, principles and guidelines, including the adaptation of the functions of the National Employment Service to meet rapid technological change; the co-ordination of immigration policy with the demands of the labour market; education, training and retraining; research and improved statistical information for advance planning; and comprehensive analyses of manpower trends on a national scale. The plans also embraced important individual projects such as the manpower mobility programme, pilot training projects, and the manpower consultative service. The functions of the National Employment Service would be broadened to offer a whole spectrum of services for both

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(12) J. Marchand, L. Hemsworth et. al. : The meaning of manpower policy, Industrial Canada, Toronto, Vol. 67, No. 3, July 1966, p.p. 91-106.

management and labour: short-range and long-range information on the employment market; a point of contact for education, training and re-training facilities; a new manpower advisory service available for consultation with management and unions on all matters related to the field of manpower adjustment and manpower mobility programmes.

All the skills needed for successful pursuit of a job, said the report, were there to be learned but on the initiative of the job occupant under the stimulus of on-the-job experience, group programmes outside the regular formal school systems (e.g. off-the-job trade schools, university extension, formal company or industry off-the-job programmes, and the schools). The framework existed; the need was to take advantage of it quickly enough so that productivity could continue to rise. Training and retraining existing members of the labour force was extremely important and the federal Department intended to raise the status of such training. It was proposed to introduce legislation to cut the connection between unemployment and adult training; an unemployed man should be paid while on a training course, not receive unemployment benefit. Pilot training projects would be established to develop new training methods for adults whose basic educational level was low.

The report concluded that in the immediate future Canada could expect shortages of almost every skill. The long-term implication was that education, skill, adaptability and mobility would acquire a significance that was only beginning to be understood. Human organisational responses to technological change were now as important as tariff rates and money supply in the context of economic policy.

A statement on manpower training adopted by the Canadian Labour Congress in April 1966 (13) said that the labour movement had to partici-

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(13) Manpower Training : Canadian Labour, Ottawa, Vol. 11, No. 5, May 1966, p.p. 43-45.

pate fully in the planning and implementation of all phases of Canada's manpower training and education programmes. Technological change would create significant alterations in many occupations and the nature and scope of education and training would have to be carefully examined and defined, bearing in mind that the most useful skill of all was the ability to adapt to change. New concepts and strategies had to be formulated as a result of co-operation between educators, labour, management and government. In long-term training care should be taken to enable the trainee to acquire a wide grasp of the theoretical principles underlying the practice of his occupation and to avoid specialisation in the early period of training so as to provide the trainee with a broad basis of skill and knowledge on which subsequent specialisation could be built with a minimum of additional training or retraining. Present academic counselling was not always related to the realities of employment and increased and improved publication and dissemination of occupational and vocational information by the various departments of labour was essential. The flow of information and experience should be maximised between government departments, industry and commerce, educational institutions and guidance counsellors, and the relationship between guidance counsellors and the National Employment Service should be much more close and practical. Uniformly high standards of teacher training and counselling should be established on a national basis.

On-the-job training, said the statement, was one of the answers to technological change and should be extended; workers willing to move from labour surplus areas should be assisted by cash grants, and adequate living allowances had to be paid during training periods. It was also asserted that without precise information indicating for which skills

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demand was declining and for which it was emerging or expanding, it became extremely difficult to design training courses which would provide the trainees with marketable skills. The Department of Manpower should therefore contain a labour market information division staffed by full-time professional economists, statisticians and other experts to provide guidelines for those who administered Canada's manpower training programmes.

In a research report on changes in occupational structure and in training practices in the metal trades in the Lyons area (14), it was pointed out that established arrangements in industry (occupational classifications, rules and regulations governing promotion, etc.) often no longer conformed to current practice. Identical terms might have entirely different meanings. The inquiry, covering more than half the persons employed in this work in the area, was conducted among 56 undertakings in the mechanical engineering and metal trades (foundry, sheet metal, automobile industry, electrical engineering, etc.) during a period of economic expansion, and showed that the firms were encountering difficulties in finding the manpower required by the new techniques. Imbalance between skills available and required was mainly the result of lack of integration of the theoretical knowledge of the individual, an outcome largely of the traditional division between manual and non-manual workers. Neither the skilled worker, narrowly specialised and lacking the necessary theoretical basis, nor the specialised technician who had difficulty in applying his knowledge to concrete projects, could meet the industry's current requirements. Workers with broad basic skills and practical technicians were

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(14) Françoise Lantier and Nicole Mandon : L'évolution des structures professionnelles dans la métallurgie lyonnaise : incidence des pratiques d'embauche et de formation, Bulletin du CERP, Paris, Vol. 16, No. 2, April - June 1967, p.p. 79 - 170.

needed.

The need to adapt to new requirements had led the undertakings to adopt a wide range of recruitment practices. At the skilled worker level (ouvrier professionel), 31 of the 56 firms set a minimum requirement of a trade certificate (certificat d'aptitude professionnelle), frequently in conjunction with traditional "work experience". The recruitment of young persons for training on the job as indentured apprentices had become comparatively rare, although six large organisations had their own apprentice training centre where apprentices followed a course similar to school-based training. Many undertakings had adopted a policy of trial periods or a fairly long period of probation when recruiting skilled workers, this replacing the trade certificate requirement or serving as proof of skills and qualifications claimed by the applicant. The promotion of semi-skilled or specialised workers (ouvrier spécialisé) to skilled workers (ouvrier professionel) was become less and less frequent. Junior technicians (agent technique), employed mainly in the methods departments, were recruited on scholastic attainment (22 firms), internal promotion (25), training at the Bureau of Standard Times (12), work experience (5), and training given by the undertaking starting at a fairly high level (5). Smaller firms (less than 100 employees) either followed the traditional internal promotion system or relied on trade certificates. Larger organisations (1,000+) relied mainly on trade certificates, and firms employing between 100 and 1,000 employees generally employed a combination of the two. The undertakings organising their own training programmes for different levels of employee were as follows : for semi-skilled workers, 38%; for skilled workers, 80%; for junior technicians, 80%; for draughtsmen, 34%; for engineers, 23%. The last

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two categories were recruited more systematically on the basis of certificates or diplomas but for the others the dividing line between training in school and training after recruitment was not very clear. A number of different patterns also existed for supplementary and upgrading training organised for promotion from one grade to another.

In 1961, the Association for Training and Promotion in the Metal Trades (Association pour la formation et la promotion dans la métallurgie) set up an inter-plant training centre, subsidised by the Ministry of Education, to give part-time training to indentured apprentices (8 hours theoretical instruction and 8 hours practical work at the centre, with 24 hours of workshop practice in the firm in liaison with the centre). This system was generally preferred to traditional apprenticeship training because it provided more theoretical instruction.

Regarding promotion, the firms still frequently depended on seniority and work experience but there was a growing tendency to subordinate both to standards of skill and knowledge or (for certain posts) to a combination of skills and knowledge previously considered to be exclusive to several specialisations. Differences in practical procedures for promotion had grown out of the institution of a system of barriers based on the acquisition of specific skills and knowledge of the job, superimposed on the traditional criteria of experience in the trade and consequently there were considerable variations in methods of promotion at each level.

There seemed to be two types of skilled worker, the skilled worker specialised in one or several types of work or machine, corresponding to the later phase of mechanisation or the first phase of automation, and the technically skilled worker with a sound basic training in a number of techniques whose work was not defined in terms of jobs but of function

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and found more especially in the second phase of automation with the introduction of complex, multi-purpose machines. The gap between the skilled worker and the technician was thus diminishing. Three types of junior technician were also distinguishable among the undertakings in the sample, the specialised technician concerned with organisational functions (methods, work organisation, materials requsitioning), the technician specialised in a given technique or operational function, and the higher technician devoted to the research and study function.

In general, the impact of technical development, and especially the introduction of automatic equipment, on occupational structures and on trade descriptions seemed to take the form of a series of adjustments which made it possible to move from the concept of horizontal assimilation of related specialisations (polyspécialisation) to one of an aggregation of trades, corresponding to a combination or re-structuring of basic skills and knowledge (polyvalence).

In most of the undertakings systematic training was tending to replace empirical training on the job and the higher standards of qualification required of skilled workers in general was increasing the backwardness of firms still relying on the old empirical methods. Training programmes of improved calibre run by individual firms still remained important, particularly for adaptation to the firm's type of production and as palliatives to employment market difficulties, but they often resulted in qualifications peculiar to the firm and restricted occupational mobility.

The Educational System

In the Netherlands, an Act concerning post-primary education was

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in 1963, amended in 1967, and the complete amended text was thereafter published (15). The Act includes provisions for vocational and technical education and classifies under vocational education a) technical education, b) education provided in domestic science schools and assimilated institutions, c) agricultural education and training, d) training for the artisan trades, commerce and the service occupations, e) business and administrative education, f) teacher training, g) socio-pedagogical education (training for occupations in youth, social, community, health and assimilated services), h) schools of fine arts and assimilated institutions including schools of dramatic art. Three levels are recognised in technical education, namely technical colleges or technical secondary schools, technical schools, and vocational schools.

In 1966 recommendations regarding the creation of a comprehensive secondary school were submitted to the Minister of Education in Sweden by the Committee on Vocational Training. This Committee subsequently submitted detailed proposals about the syllabuses to be applied in the vocational stream of the comprehensive secondary school (16). In accordance with the principles laid down by the Central Board of Education broad groups of related trades were established, specialisation being preceded by basic training following a common syllabus in one of these broad groups. Training lasts two years, divided into four semesters, the first semester being basic training. In addition to the major subjects in a given occupational group, optional subjects may be selected from other broad groups, e.g. a distributive trades' trainee may attend certain courses in

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(15) Act concerning post-primary education : Staatsblad van het Koninkrijk der Nederlanden, 's-Gravenhage, No. 387, 1967, p.p. 1075 - 1090.

(16) Vocational Training : Stockholm, Ecklesiastikdepartementet, 1967, Statens Offentliga Utredningar 1967:48.

motor mechanics. In the manufacturing processes group, basic training in a common syllabus is provided for workers in different fields such as oil refining, pharmaceutics, margarine manufacture and iron and steel, with specialisation coming during the second year of training. Basic training on a common syllabus has also been established for broad groups of craft trainees. It is also recommended that "general work orientation" (arbeitslivsorientering) should be a compulsory subject for all pupils in the vocational stream; the subject includes basic legislation, elementary economics, conditions of employment, and occupational safety. All streams in the comprehensive secondary school should have 35 to 38 class hours per week.

In a book on the organisation of training for hunters, fishermen and reindeer breeders in Siberia (17), the author considers the problem of modernising training without losing the advantages of traditional methods. Traditional training within the family covers the whole of childhood up to 10 or 12 years of age but nowadays this is interrupted when the children are sent to boarding schools for basic schooling; they often abandon their schooling to return to the traditional family procedure. Those who leave school prematurely and those who complete their primary schooling enter apprenticeship at about 14 to 16 years of age. The head of the kolkhoz or sovkhoz production team is often the family or clan chief and the apprenticeship remains very traditional. This type of training develops correct attitudes to work in difficult climatic conditions and the young people become aware of its vital importance. Instruction is strictly practical and develops initiative and a sense of responsibility. On the other hand it gives little or no instruction in basic scientific subjects and is con-

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(17) Ju. B. Strakac : Traditional concepts and current training methods, in the agricultural trades, Novosibirsk, Izdatel'stvo "Nauka" Sibirskoe otdelenie, 1966.

cive to an under-estimation or misunderstanding of modern techniques. The remedy, it is suggested, lies in strengthening the role played by general education in this agricultural training. While taking care that touch is not lost with the traditional family initiation, the school has to provide prevocational training which includes an introduction to basic scientific subjects. Starting in the first classes of primary school, the children will be taught how to make models of their future working tools. Using familiar materials (willow, birch bark, bone, hides and furs) they will learn to apprehend their native environment through their intellect as well as their senses. Starting in the fifth school year, prevocational training in agricultural trades will follow a model programme approved by the Siberian divisional education authorities for use in the common basic schools of the various regions, including actual working periods as well as lessons in agricultural crafts. Each lesson will be introduced by instruction in the science relating to the work they are to do, in addition to the knowledge accumulated through experience. In this way it is hoped that the common basic school will provide the necessary scientific foundation for training skilled manpower for hunting, fishing and reindeer breeding, with the traditional apprenticeship following the basic schooling.

Formal education by itself does not bring about economic change. This point is made in a booklet on manpower, employment and education in Tanzania (18). In 1965 some 46,000 young people in Tanzania completed seven or eight years of schooling and for the majority no really productive activity could be found. At the same time, 95 per cent of the able-bodied men and women were engaged in relatively low-yielding rural occupations. The government of Tanzania is therefore giving high priority to agricultural and rural/

(18) Guy Hunter : Manpower, employment and education in the rural economy of Tanzania, Paris, U.N.E.S.C.O., International Institute for Educational Planning, 1966, African research monographs, 9.

rural development and restricting the further expansion of recurrent expenditure on education until it can be better matched with economic opportunities. The development of Tanzania is being planned in terms of productive self-employment in modernised agriculture and since 97 per cent of an age group do not enter secondary education, it is essential to fit primary school leavers for employment. This requires a syllabus which gives the essential skills of literacy but lays emphasis on, and motivates the pupils towards, the practical conditions of modern life in a rural community.

Educational reform in the European Economic Community is dealt with in a book by Mario Reguzzoni (19), and the sections on technical and vocational education bear closely upon the subject-matter of this chapter. Concepts concerning preparation for career opportunities are changing, says Reguzzoni, and are bound to affect the educational system, especially vocational education. Qualification for a trade or occupation no longer consists only of the ability or dexterity to do the job, nor can it be acquired solely through vocational training. It must include a sense of duty and responsibility, the capacity for adaptation to new techniques, and a sense of identification with the production processes. To be genuinely qualified, the worker must be aware of the purpose of his work, must acquire the ability to concentrate, express himself and communicate, together with a feeling for teamwork, a greater capacity for thinking in abstract and general terms.

In the member countries of the European Economic Community the vocational training system has grown up, he says, alongside the system of

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(19) Mario Reguzzoni : La reforme de l'enseignement dans la Communauté économique européenne, Paris, Editions Aubier Montaigne - collection recherches économiques et sociales, 1966.

general education as a second-rate alternative providing continued primary education for pupils with a deprived background. In spite of opposition, particularly in the Federal Republic of Germany and Luxembourg, the trend in the six countries is towards a common curriculum for the first period of secondary education, following four to six years of primary schooling. The trend is particularly marked in France where multi-purpose secondary schools (colleges d'enseignement secondaire) have been set up, and even more in Italy where a single type of middle-school education (scuola media) has been created and made compulsory. Middle-school education in the six countries includes, as a general rule, an orientation and observation period of two to four years which must take into account the pupil's aptitudes, the parents' wishes, and the country's manpower requirements, in order to avoid employment problems among school leavers.

At the end of the first period, during which every pupil follows the same general secondary education, pupils branch off into a short-term vocational education for training skilled workers, or slightly longer technical education for training middle management personnel, or into prolonged general education, completed by technical specialisation at a higher or even university level, for training senior management. Transfer from one educational stream to another and admission to university courses is being made easier. Senior secondary education is being made available to all instead of just the privileged few. There is a general tendency towards increasing the vocational bias of education and a trend towards general prolonged schooling, progressively diversified, up to the age of 18, providing a broad foundation for the acquisition of either manual or intellectual qualifications, since general education is included, at different levels, throughout every stream of training. There is also a tendency in the six countries for the public authorities to play an increasing part in education with some delegation of responsibility to regional authorities so that

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local needs may be taken into account.

Despite differences between the national vocational education systems, there are four main types in the sixcountries, including in-plant or evening courses for ordinary operatives with primary schooling, secondly training for skilled workers over two or three years between the ages of 12 and 15, again based on primary school, thirdly middle-level and senior technical and supervisory staff trained in specialised schools and institutes, and finally training in establishments for higher education. The two latter types of courses last between two and five years, the trainees being between 12 and 18 years of age with general education of secondary level.

A Conference of Ministers of Education and Ministers Responsible for Economic Planning in Latin America and the Caribbean was held at Buenos Aires in June 1966 under the joint sponsorship of UNESCO and the United Nations Economic Commission for Latin America. A document was submitted to the conference for discussion by the ECLA secretariat, prepared in co-operation with the Latin American Institute for Economic and Social Planning (Doc. UNESCO/MINEDECAL/9) (20). The document stated that the characteristics of a more industrialised society would necessitate the following basic changes in the education system: the extension of primary education; the introduction of more technical subjects into secondary and higher education; the integration of training within and outside the school system; the grading of technical functions; mobility within the educational system; and increased efficiency of the system together with

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(20) United Nations Economic Commission for Latin America : The training of human resources in the economic and social development of Latin America, Economic Bulletin for Latin America, New York, Vol. 11, No. 2, October 1966, p.p. 1 - 57.

per capita cost reduction. The integration of school and outside training, it was held, would make it possible to choose the most suitable training methods for certain specialities and avoid excessive fragmentation in studies.

Vocational Guidance

It has already been noted that the problems of reconciling the individual's vocational aspirations with the state of the labour market, the specific demands of the individual firm, and the wider needs of the whole economy, are not inconsiderable.

A research study by Geneviève Latreille (21) analysed the factors affecting vocational guidance and examined the way in which the young people of a French province (Département de la Drôme) were distributed progressively between the various educational and occupational channels, the function of the public guidance services and the influence of the educational and vocational structure. The collection of data was by direct observation in an educational and vocational guidance centre between 1952 and 1962 and by a longitudinal survey of the progress of a group of young persons between 1956 and 1963. Most of the young persons stated some vocational preference at the age of 13½, but in the occupational lists shown them during guidance interviews, 40 out of 65 occupations, which were recognised as attractive, were not mentioned spontaneously, often because they were regarded as inaccessible on the basis of inaccurate or insufficient information. Some important occupations in the province or local district were not mentioned, including agriculture and an expanding building industry, while other relatively overcrowded ones like motor mechanic, hairdressing and shorthand typing, were always mentioned.

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(21) Geneviève Latreille : Orientation professionnelle et système scolaire, Paris, Centre national de la recherche scientifique, 1966.

In 1959-60, 225 contracts of apprenticeship were signed covering 55 different trades, only 7 of which could be followed in a vocational school (collège technique) and to attend a vocational school two-thirds of the apprentices would have had to change their trade or live away from home. Young people following a school vocational training course showed greater mobility than those in jobs; transfer from one stage of education to another was more often accompanied by a change of district than in other cases, being particularly frequent for the children of non-manual workers. Socio-economic level was decisive for staying on at school and at equal ability levels, the lower social categories were more dependent in their occupational choice on the facilities available in the immediate locality. The vocational schools influenced the demand by making the pupils aware of their preferences. Also, the majority of children who did not go on to the first year of secondary education were sufficiently intelligent to benefit from secondary education although only 13% actually received it, partly because there were not enough places available.

In a book about school and vocational guidance (22), Jean Drevillon stated that it was essential to consider the aspirations of the individual (individual guidance) and the requirements of society (collective orientation) together. On the economic plane it was mainly a matter of reconciling the short-term needs of the economy, the findings of socio-occupational structure projections, and the views of guidance specialists trying to help the individuals consulting them. Guidance should consist of an endeavour to establish means of developing to the fullest possible extent all the potential faculties of the individual so that he might be less/

(22) Jean Drevillon : L'orientation scolaire et professionnelle, Paris, Presses Universitaires de France, 1966, Collection "L'éducateur", No. 10.

less dependent on economic fluctuations. At the sociological level, said Drevillon, orientation on the whole varied considerably in France according to the socio-occupational category of the consultee and attitudes weighed heavily in the advice given. The situation, he asserted, was changing, however, especially in relatively poor areas. When local economic structure could offer only limited openings, education and vocational guidance were more generally recognised as necessary investments. The aptitude of an individual to assimilate the preliminary training needed to gain access to an occupation was one of the crucial psychological and educational aspects. By intensifying research efforts in the field of differential psychology, the aptitudes of the individual and the type of work in which he was most likely to succeed would become increasingly clear. The learning process should also be studied, not only for its analysis per se but also to ascertain how the individual responded. Education should become a "guide" rather than a "mould".

Although it was now admitted that orientation was a lifetime affair, continued Drevillon, there were several important stages during the life span of the individual. Empirical methods of orientation were based on imperious methods (final decision by parents, educators, employers), liberal methods (for the privileged few - trying various occupations till the right channel is found) and successive selection methods on a set scheme of selection (e.g. entrance competitions), a procedure which was equitable in appearance only, as everything depended on the evaluation (marks) obtained by the candidates in the tests to which they were submitted. Other prejudicial criteria (e.g. place and date of birth, social origins) might be present in selection schemes. All these methods called for serious reservations.

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There were, however, new methods which aimed at shortening the period of uncertainty, economising the time and effort of those looking for solutions, reducing trials and failures to a minimum, and protecting young persons against the (sometimes unavoidable) malpractices of selection. First, there were predictive methods. One of these submitted young persons to systematic, planned exercises, supervised tasks, or instruction given to small groups, all of which could serve as "indicators" of aptitudes. The exercises could form the basis for differentiating between pupils in a school system, but their effectiveness in predicting ability to adjust to the world of work was less certain. Another predictive method was the use of psychological tests which had to satisfy three main conditions: they had to provide sufficiently reliable information on the individual to serve as a basis for prognosis; they had to constitute a sound means of information for indicating the schools or training centres to which the subject should be directed; and they had to be suited to local conditions or environment.

Finally, there were educational methods which consisted in leaving the adolescent the widest possible choice, helping him to acquire self-knowledge, distinguish his own abilities and aptitudes, remedy his defects, compensate his weak points, and draw on his "reserves" at the right moment. They also informed the young person on the realities of society, in addition to documenting him on career openings. This action could be alternatively collective and individual with the target invariable: to encourage "self-orientation" on the part of the young person. The main instruments of this form of guidance were educators, doctors and psychologists.

The necessity and importance of orientation both from the national and individual angles demanded a specialised corps, guidance counsellors

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whose task was to furnish advice to those seeking it. In each department of France there was at least one public school and vocational guidance centre and the guidance counsellor was an official of the national education administration. The counsellors in a guidance centre were a team of specialists working with a number of collaborators under the head of the centre who was also a counsellor. A corps of regional inspectors attached to the school and vocational guidance services co-ordinated the work of these centres and at the Ministry of Education a guidance section (sous - direction de l'orientation) drew up the operational programmes and issued general instructions.

Research conducted in rural common basic schools in Lithuania on methods of preparing pupils to make a careful choice of their future occupation (23), led to the establishment of vocational guidance groups similar to the study circles or technical work groups already organised outside the normal teaching programme by urban schools. These groups were instituted in 1963-64 for pupils in the last three years of schooling and were planned not only for children who wanted to learn more about the trade or group of trades in which they were already interested but also for those who simply wanted to know what exactly was involved in a particular occupation. Every pupil has the opportunity to transfer from one group to another if he loses interest in the kind of work his original group is studying. When organising these groups the schools take account of local needs for particular types of skilled workers, as determined by the planning authorities. Encouragement is given, for instance, to the formation of groups of future skilled workers for mechanised agriculture

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(23) L.A. Jovajsa : Vocational guidance groups - choosing a trade, Skola i Proizvodstvo, Moscow, Vol. 11, No. 7, July 1967.

or electrical assembly workers for rural electrification schemes. Each group is led by an experienced worker who familiarises the pupils with the practical work involved in the job, guides their reading and understanding of appropriate publications, and shows films, etc. giving the members of the group an idea of the occupation(s) they intend to take up. At the end of the school year, the groups report what they have learned at a meeting for teachers, workers from the region, and parents.

The Lithuanian schools find that most of the pupils leaving a common basic school using this system choose to follow the occupation about which they have been learning (e.g. 92% of pupils in the Lauksargjaj rural district). The effectiveness of the system is attributed first to the children in the groups having first-hand experience under specialists with long experience of actual conditions in rural areas; secondly to the fact that the pupils in the group are there through interest in the occupation and thus form a homogeneous core who participate actively and communicate their enthusiasm to the other pupils, particularly those who have joined merely to find out something about the job; thirdly to the benefit the pupils get from broadly-based vocational orientation and guidance (for instance, in the agricultural mechanisation group they are introduced to the principles governing all the most commonly used mechanised techniques, starting from the study of agricultural machinery); and fourthly because observation of the pupils in the groups facilitates any selective procedure that may be found necessary.

An International Labour Office report to the Pakistan government (24) stated that Pakistan had made notable progress in changing to an

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(24) International Labour Office : Report to the government of Pakistan on the organisation of a national system of vocational guidance, Geneva, International Labour Office, 1966, Doc. ILO/OTA/Pakistan/R.33

industrial economy but of the total estimated labour force of 30 millions, 22 million were still engaged in agriculture. A high rate of turnover existed among the industrial workers and untrained labour was plentiful and cheap; for this reason employers did not feel the need for training schemes. The content of education was geared to university entrance, a policy encouraged by the practice of employers in engaging university graduates for occupations which did not require such a high level of education. Manual work had a low social status* with a resultant lack of the technical skills and knowledge necessary for economic development. Attitudes to the public employment service were negative and vocational guidance appeared to many as an intrusion into private life.

Among the suggestions made by the mission to the Pakistan government between April 1963 and June 1966 (24) was that the Youth Employment Officers of the provincial governments should be responsible for the periodic publication of bulletins summarising employment trends and that the association of interests concerned with the entry of young workers into the labour force was desirable.

In an article dealing with the uneven development of the basic vocational schools and technical colleges and the resulting imbalance between the numbers of skilled workers and technicians trained (25), Zygmunt Zielinski asserted that vocational training in full-time establishments was of extreme importance in Poland in view of the number of trainees involved./

* Available evidence suggests that this attitude to manual work is prevalent in all the developing countries.

(24) International Labour Office : Report to the government of Pakistan on the organisation of a national system of vocational guidance, Geneva, International Labour Office, 1966, Doc. ILO/OTA/Pakistan/R.33.

(25) Zygmunt Zielinski : Some problems in vocational education, Nowe Drogi, Warsaw, Vol. 21, No. 7, July 1967, p.p. 87 - 89.

involved. There was an imbalance between the two principal types of establishment - the basic vocational schools for training skilled workers and the technical colleges (technikum); training for the former category not only lagged behind training for technicians but was also insufficient to satisfy the demand for manpower in several economic sectors including mining, metallurgy, building, wood and food products. One of the factors involved was that admission to a vocational school was largely governed by the applicant's place of domicile. This practice of limiting recruitment to a locality or district was detrimental from two points of view : the pupil's choice of occupation was restricted by the locality in which he lived and the school might tend to train too many pupils for occupations with limited openings. Candidates for vocational training were generally more eager to enter the technical colleges than the basic vocational schools, due partly to the reputation of the colleges for providing a good general education coming close to the standard of the senior secondary schools. Current reform of the vocational education system was expected to remedy this state of affairs by revising the curricula in the basic vocational schools with the object of improving the standard of general education.

A survey conducted in 1963 with a sample of 245 apprentices in Rome, writes Franco Cannucciari (26), yielded the following results with respect to their motives for choosing various careers: choice based purely on chance factors (first opening available, no other ideas, etc.) 29%, choice based on definite career preferences 25%, choice based on subject's assessment of the occupation (clean, not too tiring, well paid, etc.) 17%, choice determined by subject's assessment of his own aptitudes 14%, choice influ-

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(26) Franco Cannucciari : Occupational choice and economic planning, Leva del Lavoro, Rome, Vol. 4, No. 5, Sept. - Oct. 1965, p.p. 3 - 10, 37.

enced directly or indirectly by social environment 13%. A striking feature of the replies was the high number of career choices based on chance factors; even the other reasons stated could be subsequent justifications for a choice based principally on chance factors. This was symptomatic of a situation in modern society, said Cannucciari, where too many young people, lacking wider occupational horizons, were influenced by current employment market conditions (manpower requirements of a particular occupational field or geographical region) instead of assessing them realistically in the light of their probable evolution and making a well-informed choice. The economic plan submitted by the government to Parliament predicted some far-reaching changes in the economy and the employment situation but the economic expansion envisaged by this plan would be hindered because young persons, when they were choosing their career, lacked the basic information necessary and were not really aware of the problems involved.

At a Symposium on Manpower Theory, Warrenton, U.S.A., in November 1966, J.L. Holland presented a paper (27) on factors influencing occupational choice. He suggested that questions relating to occupational choice and its implications for national planning fell into two main categories: how to increase everyone's educational aspiration, educational achievement, and eventual vocational achievement, and how to manipulate the distribution of students and adults in various fields of study and occupations. Current findings on the patterns of occupational choice which he mentioned included these: occupational choice was determined by a complex interaction of inherited aptitudes, predispositions, and personal experience; these same complex factors affected any subsequent changes in occupation or field of training; a person's educational aspiration and occupational/

(27) J.L. Holland : Current psychological theories of occupational choice and their implications for national planning, The Journal of Human Resources, Madison, Wisc., Vol. 2, No. 2, Spring 1967, p.p. 176 - 190.

occupational choice were probably more open to influence at lower rather than higher age levels; the effectiveness of vocational counselling in relation to the amount of money spent for this purpose was extremely low. Holland listed a number of measures which should be taken including the devising of new ways of recovering overlooked sources of talented individuals, the development of useful alternatives to traditional vocational counselling, greater effort to utilise the maximum talents of individuals and to provide training for leadership, more flexibility in education to enable it to respond more effectively to future developments, and the reassessing of the validity and usefulness of occupational information in order to close the gap between the actual facts of the job market and the information on which young persons based their occupational decisions.

Two examples will now be given - one from Italy and one from the U.S.S.R. - which illustrate how choice based on experience can be meaningful. Silvio Italo Colli described (28) how the directors of a vocational training centre in northern Italy with an annual intake of 250 - 300 students for a two year course including three subjects (electromechanics, mechanics, machine tool operation) observed that the students were increasingly interested in the electromechanics section (particularly the electronics stream) to the detriment of the other sections. This counteracted training plans based on the needs of the industry. An inquiry was conducted into the factors motivating the students in their occupational choice as a result of which new arrangements were made. A factual information campaign on job opportunities was introduced at the centre. The main course was divided into three periods (6 months orientation, 9 months basic training, 9 months specialisation). During

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(28) Silvio Italo Colli : The pattern of occupational choice during basic training, Formazione e lavore, Rome, No. 20, July - Aug. 1966, p.p. 90 - 93.

this period the requirements for the job and the implications of their choice were explained several times: during the interview for admission to the centre, by means of lectures organised during the orientation period, and through personal contact with teachers and instructors. The results were encouraging and by the end of the orientation period, about 20% of the students had revised their initial choice. This procedure is now a permanent feature and achieves the necessary readjustment in line with market requirements. Other vocational training centres have adopted the system.

Two Russians have written (29) about an electrical appliances factory in Kiev which has introduced an improved training system for newly engaged workers. Until recently such training consisted of initial instruction and individual practice given or supervised by a worker acting as instructor but often lacking teaching ability. With the increasingly high educational level of new entrants, this method is no longer appropriate. A special production workshop has been installed for training groups of new employees in the basic skills required for the factory (lathe and milling machine operators, fitter-machinists, assemblers) with training based on the six months syllabuses drawn up by the government Vocational and Technical Training Committee. Engineers give the theoretical instruction and qualified instructors provide the practical training. The entire training course is regarded as a trial period during which the trainee is assessed for his future work and can be reassigned to more suitable work or, if he proved unsatisfactory, be dismissed.

(29) A. Zvoncov and A. Galajcuk : How does the new worker enter production ? Professional'no-tehniceskoe Obrazovanie, Moscow, Vol. 22, No. 12, Dec. 1965, p.p. 26 - 27.

Vocational Training in the Undertaking

The growth of more sophisticated economic and educational systems is creating new problems of vocational training, not least of which is that of fitting the interests of the firm into the wider framework. In an article on vocational training and the interests of the undertaking, Jozsef Rozsa (30) noted that the increase in the number of young people entering working life in Hungary in 1967 - 69, due to the increased birth rate of the 1950s, was presenting serious problems in the field of vocational training. These problems would be aggravated by the introduction in 1967 of a new system of industrial economic management under which undertakings would have greater autonomy; they would probably, therefore, be less inclined to accept young persons for training. The new system encouraged the undertakings to plan their training needs on a long-term basis in order to obtain an automatic adjustment to manpower requirements, but difficulties would arise as regards training some 100,000 young people in excess of forecast needs who had to be integrated into the active working population during the period covered by the third Five Year Plan.

At present only 10% of apprentices were trained in full-time vocational training schools, 20% received practical training in the training workshops of firms, and the remaining 70% were trained on the job. To encourage practical training in the training workshops of undertakings, they should be accorded special facilities such as abolishing interest on capital used to acquire tools and machinery intended for the practical training of apprentices, and financing the purchase of materials used by

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(30) Jozsef Rozsa : Vocational training and the interests of the undertaking, Szakmunkasneveles, Budapest, Vol. 18, No. 2, Feb. 1967, p.p. 1 - 2.

the apprentices through the special technical development funds of undertakings. Also, to ensure fuller utilisation and better allocation of the available skilled labour force, regional councils would be given the responsibility of co-ordinating vocational training, according to instructions issued by the Ministry of Labour.

Guiseppe de Rita, writing on the role of training in the firm (31), stated that the question whether and to what extent the plant could or should be regarded as a place for vocational training was highly controversial. In the ten years 1951 - 61 the demand for qualified workers at all levels in Italy could not be satisfied by the manpower graduating from the various training establishments (vocational schools, technical colleges, training centres outside the school system, company schools, apprenticeship schemes). A substantial portion of the labour force had been trained in employment without recourse to any of these recognised types of training. This training on the job had often been no more than a rough and ready adaptation of the worker to the immediate practical requirements of the plant. More recently, the various training establishments had come into being and multiplied. If it was accepted, however, that vocational training should be closely linked with the evolution constantly taking place in production methods, obviously training in the undertaking still had an important role to play.

In its present form, nevertheless, the smaller Italian firms could not very easily provide systematic training. Thousands of small firms, often with poor management, could not provide the basic requirements for it, while the middle-sized firm in general looked only for immediate profit. Apprenticeship, in its present form, could not be considered a solution

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(31) Guiseppe de Rita : The plant as a place of training; to-day's reality and future possibilities, Formazione e Lavoro, Roma, No. 22, Nov. - Dec. 1966, p.p. 30 - 32.

to the problem of in-plant training. To ensure the effectiveness of this kind of training, there was need for research into the methods used in on-the-job training and for inspection of apprenticeship to be made the responsibility of the public authorities.

On the other hand, said de Rita, the firm did seem to be the natural place for developing certain qualities that played an important role in economic expansion, in particular, capacity for initiative, assessment of risk, inventiveness, individual responsibility, spirit of collaboration and teamwork, and mobility in employment, both horizontal and vertical. The firm would seem destined to play a major role in this field since both the educational system and the social structure were often traditionally opposed to these dynamic qualities.

In an article on the training of workers, Jean Pire (32) argued that there were two ways for undertakings to train their workers for different skill levels: internal training (conducted by the undertaking, though perhaps outside its premises) and external training (possibly within the undertaking, but conducted by some external body) Training conducted by the undertaking was generally given in the course of some occupational activity; it might be formal or be given and acquired informally on the job. It was adapted to the firm's specific needs, taking into account its own special methods of work, organisation and manufacturing processes. The head of a particular section was the person best able to pass on to his subordinates the skills and experience he himself had acquired in the firm.

This method of training was undoubtedly effective and irreplaceable but it had its limits. The range of aptitudes and skills required of

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(32) Jean Pire : Les voies de formation, Direction de Personnel, Paris, No. 108, July - August, 1967, p.p. 37 - 41.

the instructors, said Pire, was too wide for an undertaking to be able to recruit them all internally; it had to call on outside specialists who were not always familiar with the undertaking's specific needs. Also, to be comprehensive, such training was so expensive that only the larger firms could afford it. The most serious objection to training within the undertaking was of a psychological nature. It was only under conditions which encouraged the full development of his personality that the individual could learn the correct mental attitudes and behaviour; these conditions were unlikely to be created by instructors employed in a firm, and still less by the employee's superiors who were often resistant to change and inspired fear of criticism.

External training could be provided by three types of institution. First, there were private profit-making establishments which offered fairly standardised courses to attract enough persons to ensure financial stability; frequent staff changes made their quality of teaching uneven. Secondly, there were public educational establishments where teaching staff were sufficiently large to ensure that any general or specific training requirements were met. The potential of these places was not being fully realised because of a failure in liaison between industry and education. Thirdly, there were independent training centres set up and managed directly by trade associations or groups of undertakings. These centres could satisfy the undertaking's needs more adequately than the private establishments and more specifically than the public ones. Since they covered a wider range of activities than those of any one firm, they could depend on adequate financial resources to carry out their function thoroughly. It was easier for them to build up a permanent staff of instructors and training organisers who could specialise in the

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problems of the member undertakings, and being non-profit-making they were better able to call on the services of outside experts.

Once the firm had selected one of these three types of training it had to take a close interest in the training programme chosen (appropriateness of curricula, policy implications for the undertaking, adaptation to the needs of both firm and staff, follow-up on progress of trainees and quality of the instruction, related activities, etc.). Training outside the firm, thought Pire, would seem to be the type most suited for training needs chiefly concerned with personality development. Between the two extremes - knowledge of the trade and the specific requirements of the firm, and the general education and development of the individual - there was a broad range of training needs that could be satisfied equally well by training within or outside the firm. The choice between the two methods had to be dictated by training effectiveness and financial considerations. Neither method by itself could be completely satisfactory; a combination of the two was essential.

S. Batysev (33), discussing the principles to be applied in giving employees basic and further training within the firm, stated that 80% of industrial workers in the U.S.S.R. had been trained within the undertaking. The tendency of firms to provide training which was too limited in scope seriously hampered the development of industrial mechanisation and automation. It also had distinct economic disadvantages: the workers could not easily adapt to tasks which differed even slightly from those for which they were trained and the firm could generally only use them in one particular shop; research carried out within firms had revealed numerous cases where, because he was incapable of coping with breakdowns in equipment, each of these workers had to be supported by 4 or 5 workers with broader and higher skills; and labour turnover was largely due to the instability/

(33) S. Batysev : Worker's Diploma, Socialisticeskij Trud, Moscow, Vol. 12, No. 3, March 1967, p.p. 91 - 94.

instability of these workers, a result of their limited interest in their work and general lack of career prospects.

To remedy this situation Batysev suggested that part-time training within the undertaking should be reorganised and a uniform flexible system introduced which would enable workers to raise their skill levels by successive stages. In February, 1966, after considering this form of further training, the Council of Ministers' State Committee for Vocational and Technical Training, said Batysev, approved the following principles for the organisation of training by stages. The number of stages should be established separately for each branch of industry. For mechanical engineering, for example, there should be three stages. For admission to the first stage (1st Category - 6 months) a worker should have had 8 years of general education. The trainees learn to carry out the tasks corresponding to this category working on a single type of equipment and doing simple arithmetic. For admission to the second stage (2nd and 3rd Categories - 4/5 months), candidates should have completed the first stage of training and have had at least one year's experience on production work. Trainees learn to work with different types of machine-tool, do more advanced calculations (connected with setting the machines), study the construction principles of measuring and control instruments, and learn to read complicated drawings. Workers are accepted for the third stage (Higher Categories - 4/5 months) if they have completed the second stage or if they have graduated from a vocational-technical school and have 18 - 24 months' work experience. The trainees learn to execute a wide range of complex precision jobs and to manufacture parts of top quality while at the same time mastering the relevant mathematics and measurement and control techniques.

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Batysev asserted that it had been proved that whatever form of training (in-plant or school-based) workers might have received for the first four categories of qualification, only training within the undertaking could be satisfactory for the 5th and 6th Categories. No training school or centre, he said, would ever be able to provide the broad, advanced training needed for these two categories. The undertaking was therefore the place where the worker finalised and terminated his training; it should also be the authority to award the appropriate trade certificate, corresponding to the final certificate awarded by a vocational school. Such a certificate or "worker's diploma" (diplom rabocego), awarded by a mechanical engineering firm to a worker on completion of the three stages described above, should specify the trade learned and qualify the holder for employment in that trade in any comparable plant within the industry. Adoption of this system of providing basic and further training by stages would be one way of creating, for each sector of industry, a reserve force of highly skilled personnel which would take into account projected development for all the firms within the sector concerned.

A survey on vocational training in the petroleum industry with particular reference to the industrially less advanced countries (34), established that the majority of companies with full-time training schemes combine a period of school training (practical and theoretical) with a period of training in the firm with or without part-time related instruction. The combinations of years at school and years on the job vary greatly (1 + 1; 1 + 2; 2+ 3; 3 + 2). All the schools have been set up and are run and financed by the companies and in many countries there are no recruits under 18 years of age. In most cases the company pro-

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(34) International Labour Organisation : Vocational training in the petroleum industry, with particular reference to the needs of the industrially less advanced countries, Geneva, International Labour Office, 1966, Petroleum Committee, Report III, Seventh Session.

grammes are officially recognised and lead to government certificates.

All types of adult training are employed by the petroleum companies: induction, specialised training, upgrading, updating, retraining, training for promotion to supervisory or technician positions. In the industrialised countries the companies combine training schemes of their own with the use of external facilities available. In the developing countries, companies sometimes have to conduct special courses of a general character to prepare their adult workers for further vocational training. The training programmes vary greatly with regard to duration and type of course: full-time, part-time, compulsory, voluntary, on-the-job or off-the-job training, subjects and occupations taught, examinations, granting of certificates, etc. This variety is explained by the particular requirements of each company, the availability of outside training facilities and the different social and economic conditions prevailing.

After listing the problems facing the petroleum companies in the field of vocational training, the report states that most of these problems are common to all industries but they are magnified in the petroleum industry because its operations are located in remote areas and subject to hard working conditions, many of the solutions depending on social and personnel policy rather than on vocational training programmes.

I. Arnol'di reported the findings of a study made by the Institute of Hygiene for Children and Adolescents into the physical influence on adolescents of working conditions in training workshops in the technical-vocational schools and in plants in the U.S.S.R. (35). An industrial environment satisfying the standards laid down for adults did not necessarily guarantee healthy working conditions for young persons whose

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(35) I. Arnol'di : Industrial health problems of young people, Professional'no-techniceskoe Obrazovanie, Moscow, Vol. 24, No. 6, June 1967, p.p. 11 - 12.

vulnerability to various elements in the environment was much greater than that of adults. Adaptation was a dynamic process in three stages: 1) physical tension, accompanied by a temporary increase of sensitivity in reacting to the production environment; 2) diminution of this sensitivity; 3) stabilisation - generally after 2 to 3 years in production work. During this process of adaptation care had to be taken to see that adolescents were gradually accustomed to work involving more intense physical effort and to other potentially harmful influences in the production environment. Research carried out by the Institute had shown that adolescents adapted more rapidly to high temperatures when exposure was progressive rather than constant.

An article on the cost of training miners in the U.S.S.R. (36) pointed out that vocational training for workers in the coal industry was at present organised in two ways, through in-plant training and the technical-vocational school. In-plant training proved to be less expensive only in the case of the simpler trades. A survey among 18,000 miners showed that training given in the vocational schools enabled them to make more rapid progress in acquiring higher skill levels and work categories. For example, cutter-loader operators trained in the technical-vocational schools (which they entered after 8 years' general schooling) took 3 years on average to reach the 6th (highest) Category against 6 years for operators trained in the plants. The article recommended that future recruits for the mining industry should be trained in the technical-vocational schools, with in-plant training reserved for the further training and retraining of workers and for training adults wishing to enter the industry.

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(36) N. Ottenberg : Convincing facts, Professional'no techniceskoe Obrazovanie, Moscow, Vol. 24, No. 5, May 1967, p.p. 17 - 18.

An enquiry by the Scientific Research Laboratory maintained by the Council of Ministers' State Committee for Vocational and Technical Training in the U.S.S.R. (33) (page 100) confirmed that in-plant training for trades in the mechanical engineering industry requiring a fairly extensive range of skills usually lasted 6 months full-time during which the trainee-worker drew his average wage. This meant that school training for these occupations was more economical than in-plant training, not only as regards the end result (higher productivity) but also as regards the cost of training. It was recommended that in future, basic training in the plant should be used mainly for production workers in the lower skill categories while more advanced in-plant training should be reserved for workers who, in addition to their practical experience, had already acquired the necessary amount of theoretical knowledge.

The Trend Towards Broad Basic Vocational Training

There is considerable evidence from many countries of a marked trend towards broad basic vocational training. For example, an article by Horst Kuhn (37) referred to research carried out in East Germany between 1959 and 1963 which revealed the need to modify the pattern of vocational training for skilled workers in order to assist their adjustment to rapid changes in production processes and to ensure a high degree of manpower mobility for the purposes of long-term planning. Vocational training for skilled workers had to provide broad basic theoretical instruction and practical training to prepare the trainees for immediate integration into production work. Fixed demarcation lines between basic vocational training and specialisation had to disappear and this qualitative change

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(37) Horst Kuhn : Development trends in the content of socialist vocational training in the German Democratic Republic, Forschung der sozialistischen Berufsbildung, Berlin, Vol. 1, No. 1, April 1967, p.p. 9 - 48.

in vocational training syllabuses had to be accompanied by a reduction in the number of basic trades, at present very high.

A report presented to a trade union seminar on vocational training in Switzerland (38) argued that for young people, in an age of technical evolution, the essential thing would seem to be to ensure that they received broad basic training. A trade specialisation could be acquired later, on the job. Switzerland, said the report, had at present three main types of training, first plant schools which tended to train strictly in accordance with the needs of the individual firm, secondly apprenticeship (mainly in small and medium-sized firms) combined with 6 to 8 hours a week of related theoretical instruction, and thirdly full-time training in vocational schools (école de metier).

The report suggested that it should be possible to devise a mixed formula, with initial basic training - theoretical and practical - given full-time in a vocational school, followed by specialised training given in industry or in the artisan trades, with a full-time training session each year at the school. A training scheme of this kind had been started in the Canton of Neuchâtel for motor mechanics, a branch in which firms were tending to become more and more specialised. The initial school-based training of the apprentices (all of whom were under contract to a firm) lasted about 8 months and the apprentices came back to the school for 6 to 8 weeks each year to update their knowledge of electrical and automobile technology, both subject to rapid and constant evolution. Thus when their training was finished, even though the garage owner to whom they were apprenticed might deal in only one make of car, the young

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(38) P. Steinmann : La formation professionnelle et l'évolution technique, Geneva, Federation internationale des ouvriers sur métaux, 1966, Séminaire sur la formation professionnelle en Suisse, Vitznau, 17 - 22 Oct. 1966.

persons should be capable of working immediately in any undertaking in the motor industry.

Writing about the introduction of new syllabuses as from September 1967, in technical secondary schools and in basic vocational schools in Poland, Stanislaw Dobosiewicz reported (39) that production training would be organised on a national basis in the workshops of the basic vocational schools, with the exception of training for the building trades and commercial occupations. For these latter categories and for the pupils of the technical schools, production training would be organised in suitable undertakings. He gave two reasons why vocational training had to enable workers to acquire broad skills. In the first place, despite the pace at which Polish industry was modernising, the firms that would employ the workers in the near future would still be at very different stages of technical development and would need their workers to have a wide range of skills and knowledge covering widely different production techniques at varying stages of advancement. Secondly, the amount of specialised production was still limited in certain sectors of the mechanical engineering and chemical industries. It was therefore unnecessary to train a large number of specialist workers at the technician and skilled worker levels in the technical and vocational schools. These schools should concentrate on imparting a broad basic training, particularly with respect to theoretical knowledge (basic sciences, technical subjects and trade theory), which would enable the worker to specialise quite easily later on, once he had entered employment. Similarly, a survey report on current major manpower problems, prepared by the Confederation of National Trade

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(39) Stanislaw Dobosiewicz : Questions raised by the reform of vocational school syllabuses, Nowa Skola, Warsaw, No. 2, February 1967, p.p. 2 - 8.

Unions in Canada (40), included among its recommendations one to the effect that vocational training should provide each individual with broad basic training in various skills applicable to a wide range of trades. L. Zverev stated in an article (41) that the research unit of the Council of Ministers' Committee on Vocational-Technical Education in the U.S.S.R. considered that the trades taught in the vocational-technical schools should be classified in broader groups than those currently being used; the aim would be to group them according to the similarity of the skills involved. He reported that similar research carried out by a Prague Institute confirmed the advisability of regrouping trades in line with this principle; the Institute also recommended that fitter-mechanics, toolmakers, electrical fitters and heat treatment workers should receive the first half of their training according to a common syllabus, the second half being reserved for specialisation in the respective trades. A commonsense evaluation of the extent of training could be established by reconstituting the skills and knowledge the worker had to acquire to carry out his job, said Zverev, each skill item corresponding to one of the operations making up the job. By breaking down the job into its component parts for each trade, it would be possible to identify which operations implied the same level of difficulty and would require the same length of training for all trades.

Basic training, said J. Vincens (42), was multi-purpose or "despecialised" if it enabled a person to exercise one of several trades, either

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(40) Confederation of National Trade Unions : Manpower, 1965 - 1970, Montreal, Confederation of National Trade Unions, 1966.

(41) L. Zverev : A subject for research - What is the best amount of training for workers ? Professional'no-tehniceskoe Obrazovanie, Moscow, Vol. 23, No. 7, July 1966, p.8.

(42) J. Vincens : Formation professionnelle et déspécialisation, Droit social, Paris, No. 7 - 8, July-August 1966, p.p. 385 - 392.

immediately or (as was more common) following a relatively short period (less than one year) of further training or adaptation. It also facilitated subsequent retraining. Multi-purpose skills were not to be confused with adaptability during working existence, particularly where it was a question of adapting to new techniques. Multi-purpose training eliminated the necessity to provide separately for the requirements of each of the trades for which it prepared. It sufficed to provide for the group of trades and this naturally implied being informed on manpower trends in all the trades to which the training applied. Generalised application of this type of training would consequently call for a special effort to revise, for manpower forecasting purposes, the nomenclature of the trades and occupations concerned. On the other hand, if multi-purpose training was provided it also meant that the forecasts could be less rigid: errors would be less serious than with a system of specialised training where surpluses and shortages failed to counteract each other. Although multi-purpose training put off the moment of choosing a trade speciality to a more advanced stage of training, there was still sufficient time to orient the final phase of additional training according to requirements. Even the training of adults could be undertaken in this way and was already common practice. Regulation of training according to needs demanded a new type of relation between employment services, the body responsible for manpower forecasting, the training systems and theemployers.

L. Konjahin drew attention (43) to the new regulations by the Council of Ministers of the U.S.S.R. on 4th October 1965, covering manufacturing industry, under which it is possible for workers in production undertakings, with the consent of the trade unions, to be requested to exercise/

(43) L. Konjahin : Multiple trade skills, Ohrana Truda i social'noe Strahovanie, Moscow, No. 6, June 1967, p.p. 30 - 31.

exercise more than one trade or related trades, subject to the maintenance of industrial safety regulations, normal working hours, and quality standards for both basic and related trade. Under the terms of a previous order, workers learning a second trade might be released from work in their basic trade for the whole of the training period.

The necessity for broader trade classifications was mentioned by Horst Kuhn (reference 37, page 105), who noted that the German Institute for Vocational Training, after a research study, stated that 130 selected trades in the metal industries, electrical engineering, building and related trades, and the textile industry, could be regrouped into 32 basic trades or categories. To mention only a few examples from the many others available, A.W. Warner (44), in examining the impact of technological change on the American flag fleet, suggested that the eventual combining of licensed deck and engineer personnel for automated ships into a single operating category seemed to be inevitable and experiments were being made to train a group of "omni-competent" officers capable of performing both functions; Erwin Krause (45) held that established descriptions and regulations in electrical engineering (high tension electrician, electrical fitter, specialist in remote control apparatus, etc.) were completely out of date, that existing classifications had to be replaced by new criteria covering the whole electrical engineering and electronics field, that this task had been started by the Central Office for Industrial Training in West Germany, and that it would involve the analysis, synthesis and reclassification of between 2,000 and 3,000 jobs throughout the various sectors and under-

takings/

(44) A.W. Warner : Technology and the labour force in the offshore maritime industry, Madison, Wisc., Industrial Relations Research Association, 1966 : Proceedings of the 18th Annual winter meeting.

(45) Erwin Krause : Berufsforschung, Die Deutsche Berufs-und Fachschule, Wiesbaden, Vol. 62, No. 1, Jan. 1966, p.p. 22 - 30.

takings in the electrical engineering field; and Manuel Zymelman made the point (46) that while population censuses were the most readily available sources of occupational data, they were more concerned with job titles than with job content and were not very useful as a basis for occupational classification. He stressed the double-edged problem of excessive aggregation resulting from the present lack of a standard system of similar groupings and also of the application of too broad groupings which camouflaged vital jobs and concealed significant trends. He also produced some interesting evidence to support his contention that it was not the educational level but the skills of a nation's labour force which had the most lasting impact on a country's productivity.

With the problems of vocational training impinging upon so many facets of a country's economy, the need for co-operation on a wide front is vital. This point was stressed in a French Government Act of December 1966 relating to vocational training (47). Vocational training, both basic and further training, said the Act, was a "national obligation". The government, the local communities, public institutions, public and private educational institutions, associations, trade associations and professional bodies, trade unions and family organisations and undertakings would work together to ensure it. There would be a co-ordinated policy with respect to vocational training and further education for social advancement, established in close consultation with the organisations of employers and workers, details of which were outlined.

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(46) Manuel Zymelman : Skill requirements in manufacturing industries, New York, UNESCO, Committee for Industrial Development, 1966 (doc. E/C. 5/112 and E/C. 5/112/Add.1).

(47) Loi no. 66 - 892 du 3 decembre 1966 d'orientation et de programme sur la formation professionnelle, Journal Officiel de la République française, Paris, Vol. 98, no. 279, 4 Dec. 1966, p.p. 10.611 - 10.613.

Observation

This review of the international scene in relation to vocational training, a representative cross-section from a welter of available evidence, shows how different societies are tackling the problem within the framework of their own socio-economic structure and needs. There is unity within the diversity in that the basic objective is always the same - economic growth and the achievement of related social aspirations - but the problems of forecasting, planning and organising, of motivating, co-ordinating and controlling, are considerable.

We must return now, in the light of all this evidence, to the domestic scene and look particularly at the agencies which have been given special assignments in the field of vocational training, namely the government's Central Training Council and the growing number of Industrial Training Boards established to promote greater purpose and efficiency in training within the different sectors of industry and commerce.

The Central Training Council and the Industrial Training Boards

Now, when nations are coming to the conclusion that the wise approach to vocational training in a dynamic environment is to proceed on a broad front, training arrangements in the United Kingdom are being parcelled out among the various Industrial Training Boards with a theoretical overall control by the Central Training Council. Different Industrial Training Boards, supervising different industries at different stages of development with different problems, have set up different arrangements for industrial training. We have already noted that the existing artificial classification of occupations in all countries causes confusion and that effective training arrangements must be based on job content and trends rather than on job titles. Whether the establishing in the United Kingdom of Industrial Training Boards on the basis of historic nomenclature against a background

of/

of rapid technological change will prove to be wise or not only time will tell.

It would be premature to try to examine the evidence regarding the Industrial Training Boards at this moment when it is not, in fact, available. Among them, the Industrial Training Boards have produced a great variety of arrangements for the improvement of industrial training in each industry and out of this variety may emerge some useful lessons and pointers for the future, but what is singularly lacking are any agreed instruments of measurement that can tell us whether or not they are moving on sound methods and correct principles. The experiments are in process; judgment, at least of a general nature, must be reserved until the results of these experiments begin to show themselves in a meaningful way.

Let us just remember that the boundaries between the different Industrial Training Boards are perforce artificial, that the organisations and associations represented on some Boards run into hundreds, that tensions exist between economic and social objectives, that there has to be a balance between immediate and longer-term needs, that the technological trends are by no means clear, that many of the bodies that exercise considerable influence within the Industrial Training Boards are also represented on the Central Training Council, and we see that the Industrial Training Act of 1964 is still a statement of intent. The fact that the Industrial Training Boards exercise considerable powers because of their statutory privileges and financial resources is no guarantee that they will exercise these powers with wisdom. They have to state not just their objective as laid down in the Industrial Training Act; they have to promulgate not just their rules and regulations: they have to appreciate the wider framework within which industrial training operates and they must liaise

effectively/

effectively with the forces that function within this wider framework. They have to detect the shape of the future and they have to examine the complexities of training for skill, in order to uncover the underlying principles on which they must operate if they are to achieve what they want to achieve, greater industrial efficiency.

SUMMARY OF FINDINGS

In Part Two of this thesis we have considered the historical background to the development of the apprenticeship system in British industry, the main recommendations of government-sponsored enquiries of recent years concerned with industrial training and related facets have been outlined, the relationship between training and the broad government objective of economic growth has been looked at, vocational training practices in other countries have been reviewed, and some of the tasks facing the Industrial Training Boards and the Central Training Council have been stated. The essence of this accumulated evidence will now be presented under classified headings in order to facilitate a clearer appreciation of the vital factors involved in working towards a new concept of training for skill.

TRAINING FOR SKILL

Economic Growth

1. The ultimate aim of government policy is an expanding, progressive, socially acceptable economy. This sets the framework for human endeavour.

2. The government objective of economic growth depends ultimately upon human abilities and attitudes: a high rate of growth requires a high degree of motivation, inventiveness, adaptability and skill, and intelligent use of human resources.

3. The intermixture of human factors involved in the attainment of an adequate growth rate is complicated and confusing, embracing government ministries, employer and trade union groups and sub-groups, social services, and many others, and there are as many particular

attitudes/

attitudes as there are particular interests. The degree to which these different interests are effectively integrated towards the common purpose will influence decisively the rate of economic growth.

Manpower Planning

4. Shortages of wanted skills and a surplus of unwanted skills highlight the need for a purposive manpower policy designed to improve the availability, mobility and quality of our workforce. Such a policy will increase the nation's capacity for growth.

5. This manpower policy will be concerned, in the short term, with the effective deployment of human resources and, in the long term, with expansion, improvement and relevance in the skill levels of the labour force. It must be directed at the entire population.

The Educational System

6. Since all human activities are interrelated, manpower planning is only part of a still wider task that includes the whole nation, namely the development of our human resources. The educational system is therefore at the grassroots of the exercise.

7. The requirements and limitations imposed upon industrial training are pre-conditioned by what has happened previously in formal schooling. The school system must consequently be integrated with the basic objective of economic and cultural growth and related aspects in the field of industrial training.

8. In particular, formal education must cultivate attitudes and values, skills and knowledge, which will motivate purposeful behaviour at a later date when the individual takes his place in industry and society generally.

9. While the formal school system and post-school education and training must be effectively linked to meet the existing and emerging needs of a dynamic culture, this does not mean that formal school education should necessarily have a high vocational content. On the contrary, since we cannot foresee the exact nature of cultural and technological change, the weight in formal schooling must be put upon broad academic accomplishment and upon the cultivation of an attitude that accepts continued education and constructive change as normal.

10. Individual development, adaptation to a dynamic environment, is a lifelong process and industrial training is thus part of an educational continuum.

Career Orientation

11. The present system of job classifications is obsolete. Under the same job title the variation in the nature and range of activities is so wide from firm to firm as to render the title meaningless.

12. The concept of choice of employment at a moment in time must be replaced by the concept of individual development through time.

13. The concept of matching individual aptitudes and interests against the existing job titles and vacancies in a limited geographical area must be replaced by the concept of the development of individual potential in relation to employment trends and other emerging needs both regionally and nationally. To carry out this task, new methods are needed of "orientation through experience", not guidance in an emotional vacuum.

14. Career orientation requires some interpretation, however limited, of the changing cultural and industrial trends in our society. This task is too complex for the limited resources of the Youth

Employment/

Employment Service.

15. The effectiveness of the existing nation-wide system of "giving vocational guidance" is extremely low in spite of the not inconsiderable demands which it places upon the national exchequeur.

16. Effective career orientation to-day requires the co-ordinated and sustained efforts of national and local government agencies, research institutions, educational establishments, business concerns and other bodies.

The Induction Process in Industry

17. With the high rate of technological innovation and labour mobility, the limited range of activities encountered in any particular business concern, and the complexities of the whole industrial scene, induction to-day must be on a broader front than that of the individual firm.

18. Induction in industry must now be considered as part of the process of individual orientation and motivation in relation to the needs of the economy.

19. There must therefore be a hierarchy of induction processes concerned successively with the broad objectives of the British economy, those of the particular industry or industrial sector, and - when the individual joins an organisation - those of the enterprise.

Vocational Training

20 The ultimate objective of vocational education and training is to make the best possible use of human resources, to avoid waste, and to further the development of the individual potential.

21. In the field of vocational training, broad statements of intent are not enough. Government agencies must spell out their objectives

in/

objectives in detail, provide a basis for linking the activities of the nation within a purposeful pattern, and indicate the means by which the selected objectives are to be achieved. All the relevant forces within our society must be harnessed to this task with policies at the lower level being consistent with those higher up.

22. If vocational training is to be effective, government agencies and other industrial and education institutions must be restructured to meet the changing needs of the economy.

23. The basic goal of individual development in industry is to improve the individual's overall performance of work duties, to develop his capacity for enlarging the scope and meaning of his work and to increase his capacity for new, broader, and greater responsibilities.

24. Vocational training is essentially a multi-purpose exercise; it is concerned with the effective integration of a number of basic objectives, namely those of the national economy, the particular industry, the particular firm, and the particular individuals being trained. Employers, employees, shareholders, the consumer public, trade unions, industrial training boards, government and other agencies, and many other bodies are involved.

25. While the exact nature of this integration will vary considerably from country to country, from region to region, from industry to industry, from firm to firm, according to the dictates of the environment within which it operates, it must be effected in such a way as to optimise the positive contributions that can be made by the different sources and agencies.
(One important target, for example, will be to blend effectively

the strong points of training on the job (which include the cultivation of dynamic personal qualities and industrial knowledge and insight) with the advantages of education and training outside the working situation (including the learning of correct mental attitudes and broad basic skills).)

26. Since further education is accepted as a fundamental aspect of industrial training, the objectives of the education system must be worked into this process of integration.

27. Industrial education and training involves the difficult task of striking an effective balance between the acquiring of knowledge and skills that are immediately important and those that will have significance to-morrow.

28. The artificial distinction between education as the responsibility of the further education centre and training as the responsibility of the firm is no longer applicable; education and training are joint responsibilities of both the educational system and the industrial system.

29. Education and training for and in industry must take place within the total strategy of all the nation's activities, must no longer be exclusive by age, job title, sex or any other artificial category but must embrace all employees and include - as necessary and within the limitations of the resources committed - continued education and training, including updating, upgrading, and retraining, for purposes of development and adjustment to a dynamic environment.

30. With so many different and conflicting interests involved, all acting, interacting and reacting against an intensely confusing background,

the/

the problems of industrial training are highly complex. No single all-embracing formula is likely to be found which can act as a panacea in all circumstances.

31. Since industrial education and training is concerned with development of the individual through time and not with a glimpse of an industrial situation at a moment in time, the individual must be taught to think dynamically.

32. The evidence shows that the domination of the special production needs of individual concerns over the general needs of training results in over-specialised, fragmented, short-term training unrelated to wider, flexible, national, long-term requirements. The basic training needs - improvement in availability, mobility, and quality of the work force - are being pushed aside.

33. The concept of a "job", "occupation" or "trade" must give way to the concept of "work duties" and "responsibilities" and the constant mastering of skills and related responsibilities in a changing environment.

34. Paradoxically, as specialisation and mobility of labour in industry both intensify, the number of specialist skills being taught as such must decrease. Each individual must be taught to be a generalist over a broad range of related basic skills; this double function - a broad base of general training followed by a narrower more specialised training - is essential to-day if we are to have functional efficiency in a rapidly changing complex technological society.

35. The craft system and the concept of apprenticeship both offer a

closed/

closed industrial society with industrial training for the few based on the egocentric objectives of industrial organisations and competing sectional interests at particular moments in time, and a training theme of perceptual fragmentation, i.e. restricted training and experience, inflexibility and narrow specialisation.

36. The need to-day is for an open industrial society with industrial training for all based on the development of individual potential and a training theme of conceptual polyvalence, i.e. diversity of training and experience, versatility and generalism.

37. Developing our human resources, educational and manpower planning, helping the individual to realise his full potential - these are tasks that far surpass the responsibilities and capabilities of the individual firm.

38. "Experience" in industry - chance exposure to a limited range of operations within a particular enterprise - must be replaced by "controlled experience", i.e. systematic exposure to an industry - wide or even inter-industry range of skills and work duties that will help to make the trainee multi-skilled and flexible, with the accent on diversity and generalism.

APPENDIX 1

City and Guilds of London Institute Publication, June 1960, entitled "City and Guilds of London Institute : Aims and Activities - Conference on Education and Training for Scottish Industry in the Sixties - 23rd and 24th June, 1960.

Extract of Statement (page 6).

It is a basic assumption that courses are intended normally to supplement industrial experience and that students may often meet the applications of principles in the workshop before they encounter the formal statement of those principles in the lecture room. Emphasis is therefore placed on explanation of the reasons underlying the daily work of students, and syllabuses are devised with a view to the introduction of practical work and demonstrations wherever possible. It is important to note, however, that most of the practical work in a technical college course is intended to be a realistic method of learning about the properties of materials and the principles underlying industrial operations, particularly those operations which are seen less frequently in normal daily employment. It is not a substitute for training in the detailed operations of industry which is nationally accepted to be mainly an industrial responsibility and not the primary function of the technical colleges. The two tasks are, of course, complementary and should ideally be planned to link closely, but many misconceptions arise from a failure to understand the dual responsibilities. Misguided criticisms of the nature and extent of practical work in college courses are sometimes made by those who fail to realize that industry itself must accept its share of the task of training in the basic skills, more especially in the training of operatives, craftsmen and technicians.

APPENDIX 2

CHECK LIST

CARPENTRY AND JOINERY

On the following pages the basic operations in carpentry and joinery work are numbered from 1 to 172. Opposite each operation in the Answer Booklet are two sets of boxes. The first set of boxes is concerned with what you have done at work and the second set with what you have done at day release or evening classes. Above each group of two boxes are the letters O, A, L and N.

O = occasionally
A = an average amount
L = a lot
N = never

Put a cross in the appropriate box in each of the two sections for every operation to indicate whether or not you have done the operation at work, and whether or not you have done it at classes.

Example 1

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No.30				X			X	

This would mean that you have never done the operation at work, but you have done it a lot at classes.

Example 2

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No.63				X				X

This would mean that you have never done the operation, either at work or at classes.

NOW TURN OVER AND READ THE DESCRIPTION OF THE 172 BASIC OPERATIONS IN CARPENTRY AND JOINERY, MARKING YOUR TWO ANSWERS FOR EACH OPERATION BY PUTTING A CROSS IN THE APPROPRIATE BOX IN EACH OF THE TWO SECTIONS IN THE ANSWER BOOKLET.

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
TOOLS:			
	The principles of wood cutting	- across grain	1
		- with grain	2
		- shaped	3
saws, planes, chisels, oil-stones, tri-squares, bevel, foot-rule	General tools, including marking-out tools. Simple instructions including safety precautions	- selection	4
		- use	5
		- care	6
		- adjustment	7
		- sharpening	8
		- upkeep	9
plumb rules, straight-edges, gauge-boxes, templates, bobbins, etc.	Wooden tools for other trades	- construction	10
		- care	11
		- adjustment	12
		- use.	13
ploughs, rebates, throating	Special hand-tools	- care	14
		- demonstration	15
		- use	16
	Demonstrations in use of	- rip snorter	17
		- tar plainer	18
		- saw bench	19
use of fences, guards, etc. statutory regulations good housekeeping	Instruction in	- safety devices	20
		- regulations	21
		- precautions	22
for woodworking machines in general use	Instruction in care &maintenance of	- saws	23
		- cutters	24
	Plane cutters	- sharpening	25
		- setting	26
	Circular saws	- sharpening	27
	Setting up of chain and chisel mortiser		28
	Safety measures and safety guards		29
	Woodworking machine operations	- simple sawing	30
		- planing	31
		- rebating	32
		- mortising	33
router, mortice, powered hammer screwdriver	Use of powered hand tools		34
TIMBER:			
	Sequence of operations in the preparation of timber for joinery	- by hand	35
		- by machine	36
white/red/yellow/oregon pine, cedar etc.	Selection of soft wood timber		37
	Simple uses of	- plywood	38
		- hardboard	39
	Further studies of available common timbers	- characteristics	40
		- seasoning	41
		- conversion	42
		- uses	43

Explanatory notes on groups of operations, e.g. tools used, kind of work involved.	Group of Operations	Individual Operation and Number
WORKSHOP SETTING-OUT RODS:		
e.g. for construction of simple frames	Simpler uses of workshop setting-out rods	44
more difficult frames, ledged and braced doors, windows, etc.	Preparation of workshop setting-out rods	45
	Marking out in preparation for work to be machined	46
	Assembly of machined components	47
FIXING DEVICES AND JOINTS:		
e.g. metal timber connectors for use with lattice roofs	Description of fixing devices	- nails 48 - screws 49 - bolts 50 - straps 51 - wedges 52 - corrugated fasteners 53 - wood and fibre plugs 54
e.g. casein	Preparation of glue	- animal glue 55 - synthetic glue 56
partitions, floors, roofs	Common woodwork joints in carcase construction	- housing 57 - halving 58 - notching 59 - mortise and tenon 60 - dovetail 61 - common drawer dovetailing 62 - lapped drawer dovetailing 63 - rubbed joints 64 - plain 65
e.g. door standards and grounds for skirting	First fixings	66
	Simple scribing of skirting	67
	Simple mitring of skirting	68
weather acid fumes glue staining of wood etc.	Synthetic resin adhesives	- use 69 - holding power of different types 70 - durability of different types 71 - effects of these on joinery of various surfaces and joints 72
	Scribing for inclined joints	73
e.g. nailed/screwed metal connectors	Testing of strength of	- timber and metal joints 74 - adhesive joints 75
e.g. swing doors, sliding partitions	Use of common and specialised ironmongery for	- doors 76 - screen partitions 77 - windows 78
GROUND AND UPPER FLOORS IN TIMBER:		
	Discussion of ground floor in timber: Spacing of joists and laying of same with flooring included	79
	Discussion of ground and upper floors in timber: Trimming and strutting or dwanging	80
	Discussion and sketching of double floors in timber, and with timber and steel beams	81

Explanatory notes on groups of operations e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
CENTRES FOR ARCHES:			
	Cor.struction of centres for	- brick arches	82
		- stone arches	83
FORMWORK AND SHUTTERING:			
boxes, lintels, posts, simple sills, kerbs, panels, slabs, etc. as required with ancillary trades	Simple formwork details for pre-cast work	- individual	84
		- repetition	85
	Preparation of formwork for in situ concrete	- simple columns	86
		- beams	87
		- columns with mushroom head	88
		- foundations, retaining walls	89
		- reinforced concrete walls	90
SHORING:			
	Timbering of trenches		91
	Dead shores		92
	Raking shores		93
	Flying shores		94
ROOFS:			
	Discussion and probable model of single roof, including ceiling joists, their general construction and erection		95
	Simple roofing : vixing of rafters	- common	96
		- hip	97
		- jack	98
	Various finishes of eaves	- open	99
		- closed	100
		- flush	101
	Use of steel roofing square for setting out	- common rafters	102
		- hip rafters	103
		- jack rafters	104
	Construction of trussed roofs		105
	Construction of hammer-beam roof		106
	Construction of roof over irregular plan		107
	Construction of	- latticed roofs	108
		- laminated roof trusses	109
		- shell roof	110
		- built up roof T.D.S. type	111

Explanatory notes on groups of operations, e.g. tools used, kind of work involved.	Group of Operations	Individual Operation and Number	
WINDOWS:			
simple casement	Construction		112
with fixed sash	Fixing		113
more advanced forms	Construction of frames		114
of casements with	Construction of sashes		115
sashes opening in or	Fitting of sashes to frames		116
out, with or without	Fitting with associated ironmongery		117
transomes	Fitting frames in buildings		118
sash and cased	Construction of frames		119
window	Construction of sashes		120
	Fitting sashes		121
	Weighing sashes		122
	Hanging sashes	- cords	123
		- "unique" springs	124
	Fixing appropriate fittings		125
DOORS:			
ledged door	Construction		126
small gate	Fitting and hinging		127
	Fitting appropriate ironmongery		128
framed, ledged and	Construction		129
braced doors,	Fitting and hinging		130
panelled doors,	Fixing door stop, facings or architraves		131
flush doors			
Doors with	Construction		132
shaped heads	Fitting and hinging		133
STAIRS, HANDRAILS, NEWELS, PANELLING:			
	Construction of straight-flight stairs		134
	Construction of stairs	- dog-legged	135
		- open newel	136
		- geometrical	137
		- laminated spines	138
	Construction of built-up	- handrails	139
		- newels	140
	Construction of	- single twist wreathed handrail	141
		- swannecks	142
		- ramps	143
		- scrolls	144
	Panelling	- spandrel	145
		- wall	146

Explanatory notes on groups of operations, e.g. tools used, kind of work involved.	Group of Operations	Individual Operation and number	
DOMESTIC FITTINGS:			
	Construction of simple domestic fittings	- wooden brackets	147
		- shelving	148
		- tables	149
		- cupboards	150
		- fitments	151
		- boxing in of sinks	152
		- boxing in of baths	153
	Miscellaneous work in pipe casings		154
	Supports to cisterns		155
FINISHING SURFACES AND PROTECTING BUILDINGS FROM RAIN			
	Preparation of surfaces for varied finishes	- painting	156
		- polishing	157
		- spraying	158
	Discussion of methods used to protect buildings from rain	- overlap of slates & tiles	159
		- slopes of roof	160
		- weatherings, sills, drips and throatings	161
		- joints to exclude water	162
		- capillary effects between surfaces close together	163
		- anti-capillary grooves	164
CIRCULAR WORK:	Construction of a circle-on-circle centre for a brick arch		165
	Construction of a circle-on-circle	- window	166
		- doorhead	167
	Construction of windows with circular head and splayed linings		168
MISCELLANEOUS:			
litany desks, pew ends, church notice boards, etc.	Church furniture		169
	Portion of a curved counter		170
	Geometrical display stand		171
	Quantities and estimating, related to Scottish mode of measure		172
OTHER WORK:			
	Any work you have done not so far covered, e.g. pivot hung sashes, timber garages, portable sheds, greenhouses.		

APPENDIX 3

CHECK LIST

ELECTRICAL INSTALLATION WORK - COURSE A

On the following pages the basic operations in Electrical Installation Work - Course A are numbered from 1 to 130. Opposite each operation in the Answer Booklet are two sets of boxes. The first set of boxes is concerned with what you have done at work and the second set with what you have done at day release or evening classes. Above each group of four boxes are the letters O, A, L and N.

O = occasionally
A = an average amount
L = a lot
N = never

Put a cross in the appropriate box in each of the two sections for every operation to indicate whether or not you have done the operation at work, and whether or not you have done it at classes.

<u>Example 1</u>

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No. 30				X			X	

This would mean that you have never done the operation at work, but you have done it a lot at classes.

<u>Example 2</u>

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No. 63				X				X

This would mean that you have never done the operation, either at work or at classes.

NOW TURN OVER AND READ THE DESCRIPTION OF THE 130 BASIC OPERATIONS IN ELECTRICAL INSTALLATION WORK, MARKING YOUR TWO ANSWERS FOR EACH OPERATION BY PUTTING A CROSS IN THE APPROPRIATE BOX IN EACH OF THE TWO SECTIONS IN THE ANSWER BOOKLET.

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
pliers, knife, side-cutters wire strippers, screw drivers	Hand tools used in sheathed wiring installations	- care and use	1
		- need for safety and care	2
	Explanation and demonstration of treatment of electric shock and artificial respiration		3
	Explanation of methods of preparing terminations of different types of cable used in sheathed wiring systems	- VRI	4
		- PVC	5
		- TRS	6
		- LCC	7
	Preparing terminations of - VRI	- sheathed cables	8
	- PVC	- sheathed cables	9
e.g. supply mains, fuse lamp, switch and ammeter, voltmeter, conductors and insulators	Explanation of simple electric circuits		10
	Connection of wiring to	- fuse terminals	11
		- switches	12
		- ceiling roses	13
use of buckle clips and spacing -PVC, TRS, LCC	Fixing sheathed wiring systems		14
	Use of glands at terminations		15
	Use of ammeter and voltmeter, with emphasis on differences		16
two core, twin-twisted, three core (CTS, PVC, cotton), use of cord-grip	Types of flexible cord		17
	Current ratings and weights they can support		18
	Wiring of	- ceiling roses	19
		- lampholders	20
e.g. braiding cut by half-inch from conductor	Attention to details		21
	Explanation of	- series and parallel circuits	22
		- heating elements	23
		- cookers	24
		- control of lighting by switches	25
make-up of stranded cables and common sizes used	Care and use of wire gauges		26
relationship of volts, amperes and watts	Wattage of lamps and heading elements		27
fusing, etc.	Examination of the construction of a consumer's control unit		28
	Wiring arrangements		29
limitations imposed by I.E.E.	Grouping of lamps on final sub-circuits		30
ensuring correct polarity and earthing arrangements	Termination of wiring in socket-outlets		31
binding of ends, earthing	Wiring 3-pin plugs and connectors		32
3 colours	Colouring of cores of flexible cables		33
explanation, earthing arrangements, use of earth-continuity conductors	Simple supply system		34

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number
twin (red/black), 3 core (red/white/blue), 13A, 3-pin, socket outlets, etc.	Wiring simple circuits using coloured cables, including switches, lamps and sockets	35
	Wiring bell circuits with indicators	36
	Construction of electric bell	37
	Connecting up cells in series and parallel to external circuit and measuring voltages and current	38
	Study of Regulations for the Electrical Equipment of Buildings as related to First Year work	39
	Care and use of tools connected with conduit system	- tripod 40 - vice 41 - hacksaw 42 - file 43 - reamer 44 - pipe wrenches 45
	Care and use of stocks and dies	46
	Conduit threading	47
	Short-circuit due to insulation failure	48
	Termination conduits in boxes	49
	Use of couplings, locknuts and bushes	- male bushes and couplings 50 - female bushes and locknuts 51
	Arrangement of distribution system for a single-phase installation choice of conductor size	52
importance of good continuity (removal of paint)	Termination of conduits and wiring in a Single Pole and Neutral fuse board	53
using various types of saddles and crampets	Methods of fixing conduit-surface and sink work	54
	Use of earth-continuity tester	55
	Use of insulation resistance tester	56
using stripping tool, crimping tool, etc.	Preparing termination of 2-core mineral-insulated cable	57
	Mineral-insulated cables	- construction 58 - application and use 59
	Simple glands for mineral-insulated cables	60
	Terminating mineral-insulated cable at a switch and lighting point, etc.	61
	Mineral-insulated cables	- setting 62 - fixing 63 - dressing 64
	PVC -armoured cables	- construction 65 - application and use 66 - simple glands 67
	PVC -sheathed cables	- construction 68 - application and use 69 - simple glands 70

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number
	P.I.L.C.S.W.A. cables	- construction 71
		- application and use 72
		- terminal boxes 73
	Wiring bell circuit with relay for continuous ringing	74
	Use of relays and contactors	75
	Construction and assembly of	- electric fires 76
		- electric irons 77
		- cookers 78
	Description of moving-iron and moving-coil meters	79
	Construction & assembly of immersion heaters	80
	Application and use of thermostats	81
	Study of Regulations for the Electrical Equipment of Buildings as related to Second Year work	82
	Care and use of	- blowlamps 83
		- soldering irons 84
	Sweating lugs on cables	85
	Use of fluxes	86
	Soldering	- soft 87
		- hard 88
	Introduction to single and three-phase circuits	89
	Derivation of single-phase circuits from medium-voltage 3-phase supply	90
	Three-phase supply transformer and medium voltage distribution	91
	Earth-loop circuit	92
	Riveting	93
	Transformer action	94
	Need for lamination	95
	Turns ratio and voltage ratio	96
	Use of chokes for fluorescent fittings	97
	Care and use of	- drills and chucks 98
		- taps and dies 99
	Action of current-carrying conductor in magnetic field	100
	Moving-coil meter	101
	Care and use of portable electric tools	102
	Replacement of carbon brushes	103
	Principle of simple electric motor and generator	104
	Action of commutator	105
	Reversal of rotation of d.c. and universal motors	106
	Squirrel-cage motor	- examination of parts 107
		- assembly 108
	Wiring connections for simple a.c. induction motor and starter	109
altering of connections	Reversal of direction of rotation	110

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number
circuit diagrams	Simple starters for 3-phase and single-phase induction motors	111
	Use of push buttons	112
by instruments	Tracing circuits	113
	Preparation of circuit diagrams	114
	Regulators and rheostats	115
	Constructional details and maintenance	116
belt drives, direct coupling, gear drives	Fixing and alighment of small motor drives	117
	Simple theory of a.c. circuits	118
	Chokes and capacitors	119
	Meaning of power factor	120
	Rating of plant in kw and kva	121
operating and circuit diagrams	Wiring fluorescent lamp with separate control gear	122
	Testing polarity of switches	123
	Fault-finding	124
using instruments - insulation resistance, continuity tester, - washing machines, vacuum cleaners, electric irons, etc.	Tracing earth faults in	- circuits 125 - appliances 126
	Use of power-driven electrical	appliances - washing machines 127 - vacuum cleaners 128 - electric irons etc. 129
	Study of Regulations for the Electrical Equipment of Buildings as related to Third Year work	130

APPENDIX 4

MECHANICAL ENGINEERING CRAFT PRACTICE

On the following pages the basic operations in Mechanical Engineering Craft Practice are numbered from 1 to 271. Opposite each operation in the Answer Booklet are two sets of boxes. The first set of boxes is concerned with what you have done at work and the second set with what you have done at day release or evening classes. Above each group of four boxes are the letters O, A, L and N.

O = occasionally
A = an average amount
L = a lot
N = never

Put a cross in the appropriate box in each of the two sections for every operation to indicate whether or not you have done the operation at work, and whether or not you have done it at classes.

Example 1

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No. 34				X			X	

This would mean that you have never done the operation at work, but you have done it a lot at classes.

Example 2

	AT WORK				AT CLASSES			
	Have Done				Have Done			
	O	A	L	N	O	A	L	N
Operation No. 74				X				X

This would mean that you have never done the operation, either at work or at classes.

NOW TURN OVER AND READ THE DESCRIPTION OF THE 271 BASIC OPERATIONS IN MECHANICAL ENGINEERING CRAFT PRACTICE, MARKING YOUR ANSWERS FOR EACH OPERATION BY PUTTING A CROSS IN THE APPROPRIATE BOX IN EACH OF THE FOUR SECTIONS IN THE ANSWER BOOKLET.

Explanatory notes on groups of operations, e.g. tools used, kind of work involved.	Group of Operations	Individual Operation and Number	
FITTING:			
	Introduction to general workshop rules and regulations		1
files, hacksaw, hammer and flat chisel	Common fitting tools. Simple instruction including safety precautions	- selection	2
		- use	3
		- care	4
		- adjustment	5
		- sharpening	6
		- upkeep	7
	The bench vice	- construction	8
		- care	9
		- use	10
rule, square, calipers, scriber, centre punch, odd-leg caliper, pop punch, dividers	Marking and measuring instruments	- care	11
		- use	12
	Simple marking out		13
straight lines	Filing to line and shape		14
e.g. slow spiral drill quick spiral drill	Sensitive drilling machine	- use	15
		- methods of holding work	16
		- care and maintenance	17
		- safety precautions	18
		- drilling with twist drills	19
		- "drawing" of holes when drilling	20
	Twist drills	- care and use	21
	Correct sharpening of drills		22
contours	More difficult filing to line and shape		23
	Use of calipers and micrometers for taking and transferring dimensions		24
	Introduction to properties and uses of common irons and steels		25
	Identification of irons and steels by workshop methods		26
safe-edge for tinplate, folded and grooved joints	Simple sheet-metal work, introducing bending, forming and soldering		27
guillotine, special hammer, folding bars	Common sheet metal working tools	- care	28
		- use	29
anvil, tongues, hand hammer, sledge hammer, stakes, forge	Common forging tools	- care	30
		- use	31
	Common forging and non-forging metals		32
	Simple forging, introducing bending, twisting, drawing down and upsetting		33
	Tapping and the use of stocks and dies for screwing		34
B.S.W., B.S.F., Unified B.A. and B.S.P.	Types of screw threads and their uses		35
	Use of screw-thread tables		36
taper, intermediate, plug, ring die, split die, die nut	Types of taps and dies used in fitting work		37
e.g. file, chisel, hacksaw blade	Bench tools	- use	38
		- cutting action	39
		- tool angle	40
		- sharpening	41
		- safety precautions	42
offhand grinder	General tool grinding machine	- use	43
		- safety precautions	44

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
TURNING:			
	Turning between centres to rule and calipers	- plain turning	45
		- stepped turning	46
	Use of the lathe	- essential features	47
		- practice in the use of controls	48
		- speed and feed changing	49
		- lubrication	50
		- care and maintenance	51
		- safety precautions	52
	Care of centres		53
	Checking and setting for parallelism		54
	Turning to rule dimension and micrometer dimension	- radius - stepped spindles	55
		- square - stepped spindles	56
left and right hand, light turning and facing tool, finishing, forming, externl screw cutting, knifing	Standard types of lathe turning tools and their application		57
	Use of the chucks		58
	Setting work	- three-jaw self-centring chucks	59
		- four-jaw independent chucks	60
roughing, finishing, diameter, material	Feeds and speeds for turning and drilling irons and steels		61
plug, gap, ring, length	Types of limit gauge and their uses for turning		62
DRILLING:			
bench and pillar types	Use of the drilling machine	- essential features of the bench type	63
		- essential features of the pillar type	64
		- lubrication	65
		-care and maintenance	66
		- safety precautions	67
	Setting up work on the drilling machine		68
	Drilling with	- twist drills	69
		- flat drills	70
	Spot facing		71
	Counter-sinking		72
	Counter-boring		73
	Sharpening of	- flat drills	74
		- twist drills	75
	Use of drilling jigs		76

FITTING/

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
FITTING:			
e.g. angle plates, rules, Vee block, surface gauge	Marking-out on the surface table, using surface gauges and other tools		77
	Use of the combination square and protractor and of angle plates		78
	Further work on the properties and uses of ferrous metals, including medium and high carbon steels		79
	Introduction to the properties and uses of	- copper	80
		- tin	81
		- zinc	82
		- aluminium	83
		- common alloys	84
rivets, machine screws	More difficult fitting, including riveted and screwed assemblies and some work to limits		85
	Introduction to tolerances and to clearance, interference and transition fits		86
e.g. caliper, snap, plug	Common types of limit gauge	- care	87
		- use	88
	The use of venier calipers		89
e.g. solder, steel, brazing spelter	Melting points of the more important engineering materials		90
	The production of mating parts including dove-tailing and the use of standard workshop gauges		91
	Vernier height and depth gauges	- care	92
		- use	93
	The expansion of metals when heated and its effect on workshop operations		94
	Further simple sheet metal work, including	- cylindrical and conical shapes	95
		- beading and wiring	96
	The forging of	- simple hand tools	97
		- turning tools	98
e.g. chisel, scribe, centre punch, lathe tool, shaping tool	Hardening and tempering high-carbon steel tools		99
SHAPING/			

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
SHAPING:	Use of the shaping machine	- essential features	100
	- practice in	use of controls	101
		- lubrication	102
		- care and maintenance	103
		- safety precautions	104
	The shaping of flat surfaces parallel and square, to produce an accurate rectangular block		105
TURNING:	Use of boring bars and tools		106
	Standard shapes and their applications		107
	Parting tools and tool angles		108
	The effects of force in stretching, compressing, bending, twisting and shearing engineering materials		109
	Further chuck work, including	- drilling	110
		- plain boring	111
		- reaming	112
		- stepped boring	113
		- facing	114
		- parting-off	115
	Explanation of effects of feed and tool height on cutting angles and clearances		116
	Types of mandrels	- parallel mandrel	117
		- screwed mandrel	118
	Turning and facing on the mandrel		119
MILLING:	Use of plain milling machine		
	- essential features of horizontal type		120
	- essential features of vertical-spindle type		121
	- practice in use of controls		122
		- lubrication	123
		- care and maintenance	124
		- safety precautions	125
	The milling of flat surfaces, parallel and square, to produce a finished block		126
	The mounting of cutters on arbors		127
	Care in the handling of arbors		128
	The importance of true running of cutters		129
	Explanation of workshop application of leverage, involving spanners, clamps, screwing tools and operating levers		130
	Use of milling cutters		
	- essential features of cylindrical type		131
	- essential features of side and face type		132
	- essential features of face and end type		133
	- care and maintenance		134
	- safety precautions		135
FITTING/			

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Groups of Operations	Individual Operation and Number	
FITTING:			
flat, half-round, three-cornered, hook	Types of hand scraper, their care and use		136
	Use of scrapers as an accurate finishing process	- on flat surfaces	137
		- on curves surfaces	138
	The sharpening of scrapers		139
	Use of the metric	- micrometer	140
		- vernier	141
	Drilling and reaming holes in correct location		142
	Fitting	- dowels	143
		- pins	144
		- studs	145
		- bolts	146
	Further work on the heat treatment of steels, including	- normalising	147
		- annealing	148
		- case-hardening	149
		- elementary treatment of critical points and the effect of carbon content	150
		- use of heat-treatment equipment	151
		- safety precautions	152
involving use of the vernier protractor and more difficult setting on the surface table	More difficult work in marking out including	- tangents	153
		- curves	154
		- templates	155
swiss, warding, mill, needle, pillar, narrow pillar, precision files	More advanced fitting, including the use of less common files and involving precision work		156
	Types of keys, their purpose and application		
	- gib keys	- manufacture	157
		- fitting	158
	- feather keys	- manufacture	159
		- fitting	160
	Use of	- breast drills	161
		- ratchet drills	162
	Use of power-driven portable tools	- electric	163
		- air-operated	164
	Explanation of appropriate standards of accuracy and surface finish in machining operations		165
TURNING:	Use of high-speed steel tools	- types	166
		- care and maintenance	167
		- typical speeds and feeds	168
		- sharpening	169
	Use of high-speed cemented carbide tools	- types	170
		- care and maintenance	171
		- typical speeds and feeds	172
		- sharpening	173
	General chuck and centre work to finer limits		174
	Use of the multi-tool post		175

Explanatory notes on groups of operations, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number
	Use of	- fixed steadies 176
		- travelling steadies 177
	Introduction to face-plate work, not involving balancing.	178
	Clamping precautions	179
	Explanation of standard taper systems	- British Standard 180
		- Morse 181
		- Brown and Sharpe 182
	Taper-turning -	- by off-set centre 183
	- by cross-slide inclination	184
	- by taper-turning attachment	185
	Plain taper-boring	186
arrangement of the lathe, offset top-slide to half-included angle of thread, gear train, etc.	Introduction to screw-cutting	187
	Production of single-start	
	Vee threads	- right-handed 18[illegible]
		- left-handed 189
		- external 190
		- internal 191
	using	- single-point tools 192
		- machine chasers 193
	Setting-up of change wheels	194
	Operation of the quick-change gear-box for screw-cutting	195
PLANING:	Use of the planing machine	- essential features 196
	- methods of setting-up clamping and aligning work	197
		- lubrication 198
		- care and maintenance 199
		- safety precautions 200
SHAPING:	Shaping of inclined faces by inclination of the machine head and machine table, and by adjustable angle plate	201
	More difficult shaping, including - form and re-entrant work	202
	- work set up from the table	203
	Use of the slotting machine	- essential features 204
		- lubrication 205
		- use of the rotary table 206
	- setting up,	clamping and aligning work 207
		- care and maintenance 208
		- safety precautions 209
MILLING:	Use of cutters -	- form-relieved 210
		- angle 211
		- tee slot 212
		- inserted tooth 213
		- fly 214
	The milling of	- slots 215
		- grooves 216
		- key-ways 217
e.g./		

Explanatory notes on groups of operation, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number	
e.g. swivel vice, dividing head	Common methods of milling inclined faces		218
	Typical feeds and speeds in milling		219
	The use of the dividing head and tailstock for work requiring simple direct indexing		220
	Safety precautions in the use of the dividing head		221
	Appropriate standards of accuracy and surface finish in machining operations		222
FITTING:	Assembly of parts made by yourself, including fitting of keys, studs, bearings, etc. required and making of necessary fits and joints, working to detail and arrangement drawings		223
	The installation and alighment of	- machines	224
		- prime movers	225
		- pumps	226
	The making of joints and the fitting of packings		227
	The use of lifting appliances		228
	The use of extractors and presses		229
	The slinging and handling of heavy machinery		230
	Special precautions in the removal and replacement of heavy parts		231
TURNING:	Standard forms and uses of	- square threads	232
		- Acme threads	233
		- buttress threads	234
	Common applications of multi-start threads		235
	Further work in screwcutting including - a standard external thread other than a Vee thread		236
	- a standard external thread of more than one start		237
	Simple form turning, including the use of form tools		238
	More difficult chuck and faceplate work, including second-operation mounting, and setting, on	- castings	239
		- forgings	240
	Faceplate work involving simple balancing		241
	Simple button boring		242

MILLING/

Explanatory notes on groups of operation, e.g. tools used, kind of work involved	Group of Operations	Individual Operation and Number
MILLING:	More difficult milling operations, with work set on and from the table, including castings and forgings, and involving some face milling	243
vice, dividing head, milling fixture	Use of work-holding devices in milling	244
	Use of the universal dividing head	- essential features 245
		- care and maintenance 246
		- safety precautions 247
	Use of rotary table	- essential features 248
		- care and maintenance 249
		- safety precautions 250
	The milling of	- flutes 251
		- splines 252
		- spur gear teeth 253
	using the universal dividing head	
	Alternative methods for milling operations on standard types of milling machines	254
PRECISION GRINDING:	Use of precision grinding machines	255
	- essential features of cylindrical type	256
	- essential features of surface-grinding type	257
	- essential features of tool and cutter grinder	258
		- lubrication 259
		- care and maintenance 260
		- safety precautions 261
	Wheel speed, work speed, and feed of cut	262
	The use of coolants	263
	Grinding to limits of ± .0005 in.	- external 264
		- internal 265
		- surface 266
	The prevention of distortion in work during grinding	267
	Wheel mounting and trueing	268
	Grinding as a finishing process to other machinery	269
	Common grinding allowances	270
GENERAL MACHINING:	The complete machining of components, involving turning, boring, milling, drilling, grinding, heat-treatment	271

APPENDIX 5

ANSWER BOOKLET

CARPENTRY AND JOINERY

Name: . . . . To-day's Date. . . . . . .

Age: Years. . . . . Months . . . . Date of Birth. . . . . . .

Address: ______________________________

Secondary School attended before entering employment: ______________

Type of Secondary School Course: (i.e. 3 years or 5 years): ______________

Names of foreign languages you studied at school: ______________

Class you were in at time of leaving school: ______________

Date of starting apprenticeship: ______________

Date of completion of apprenticeship: ______________

State whether Day Release or Evening Classes: ______________

Date you started Day Release or Evening Classes: ______________

Class you are in at present:
Type of Course (e.g. City & Guilds, National Certificate): ______________

____

Expected date of completion of Day Release or Evening Classes: ______________

Date you joined present Firm: ______________

Name and Address of Firm: ______________

____

No. of employees in Firm: ______________
How employed (e.g. Maintenance, Jobbing, General Building): ______________

What kind of job did you want on leaving school? ______________

How did you obtain your apprenticeship in carpentry and joinery?
(e.g. father spoke to employer, sent by Youth Employment Officer, notified of vacancy by schoolteacher, answered advertisement, approached employer on own initiative, asked by employer to join firm, employer told one of your relatives that he needed an apprentice, etc.)

____

____

Employment Record since leaving School:

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving

Operation	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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48																
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
91																
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Operation	AT WORK: Have Done O	A	L	N	AT WORK: Have Seen O	A	L	N	AT CLASSES: Have Done O	A	L	N	AT CLASSES: Have Seen O	A	L	N
136																
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Other/

	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
Other work (please state)																

APPENDIX 6

ANSWER BOOKLET

ELECTRICAL INSTALLATION WORK - COURSE A

Name . . . . .To-day's Date. . . . .

Age: Years . . . . Months . . . . .Date of Birth. . . . .

Address: ______________________________

Secondary School attended before entering employment: ______________

Type of Secondary School Course: (i.e. 3 years or 5 years): ______________

Names of foreign languages you studies at school: ______________

Class you were in at time of leaving school: ______________

Date of starting apprenticeship: ______________

Date of completion of apprenticeship: ______________

State whether Day Release or Evening Classes: ______________

Date you started Day Release or Evening Classes: ______________
Class you are in at present:
Type of Course (e.g. City & Guilds, National Certificate): ______________

Expected date of completion of Day Release or Evening Classes: ______________

Date you joined present Firm: ______________

Name and Address of Firm: ______________

____

Number of Employees in Firm: ______________

How Employed (e.g. Maintenance, Contracting): ______________

What kind of job did you want on leaving school? ______________

How did you obtain your apprenticeship in electrical installation?
(e.g. father spoke to employer, sent by Youth Employment Officer, notified of vacancy by schoolteacher, answered advertisement, approached employer on own initiative, asked by employer to join firm, employer told one of your relatives that he needed an apprentice, etc.)

____

____

Employment Record since leaving School:

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving

	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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Operation	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
46																
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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Other Work / over

	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
Other Work (please state)																

APPENDIX 7

ANSWER BOOKLET

MECHANICAL ENGINEERING CRAFT PRACTICE

Name: . . . . .To-day's Date. . . . .

Age: Years. . . . . Months. . . . . Date of Birth.. . . . . . .

Address: ______________________________

Secondary School attended before entering employment: ______________________________

Type of Secondary School Course: (i.e. 3 years or 5 years): ______________________________

Names of foreign language you studied at school: ______________________________

Class you were in at time of leaving school: ______________________________

Date of starting apprenticeship: ______________________________

Date of completion of apprenticeship: ______________________________

State whether Day Release or Evening Classes: ______________________________

Date you started Day Release or Evening Classes: ______________________________

Class you are in at present: . . . .

Type of Course (e.g. City & Guilds, National Certificate): ______________________________

Expected date of completion of Day Release or Evening Classes: ______________________________

Date you joined present Firm: ______________________________

Name and Address of Firm: ______________________________

____

Number of Employees in Firm: ______________________________

How employed (e.g. Maintenance, Jobbing, Production): ______________________________

What kind of job did you want on leaving school? ______________________________

How did you obtain your apprenticeship ?
(e.g. father spoke to employer, sent by Youth Employment Officer, notified of vacancy by schoolteacher, answered advertisement, approached employer on own initiative, asked by employer to join firm, employer told one of your relatives that he needed an apprentice, etc.)

____

____

Employment Record since leaving School:

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving

	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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	A T W O R K								A T C L A S S E S							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
46																
47																
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	AT WORK								AT CLASSES							
	Have Done															
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
136																
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
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180																
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
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	AT WORK								AT CLASSES							
	Have Done				Have Seen				Have Done				Have Seen			
Operation	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
268																
269																
270																
271																

	Have Done				Have Seen				Have Done				Have Seen			
	O	A	L	N	O	A	L	N	O	A	L	N	O	A	L	N
Other Work (please state)																

APPENDIX 8

Survey of Three Craft Skills

Details of 1226 Trainees and Tradesmen who completed Answer Booklets

CARPENTERS AND JOINERS

363 day release students attending the City and Guilds Course in carpentry and joinery.

School of Building, Cambuslang

1st Year	25
2nd Year	20
3rd Year	22
4th Year	8
5th Year	8
F.T.C. 2nd Year	1
Total	84

Stow College of Building, Glasgow

1st Year	29
2nd Year	31
3rd Year	27
5th Year	8
Total	95

F.T.C. = Full Technological Certificate

School of Building, Edinburgh

1st Year	59
2nd Year	24
4th Year	11
Total	90

Falkirk Technical College

1st Year	25
2nd Year	28
3rd Year	35
4th Year	2
Total	90

ELECTRICAL INSTALLATION WORK

447 electrical students following the City and Guilds Electrical Installation Work Course A or B except where otherwise stated.

Esk Valley College, Midlothian

1st Year (Mining) (Full-time)	13
2nd Year "	25
3rd Year "	19
4th Year "	9
5th Year "	15
01 (Mining Elect.)(Nat.Cert)	2
S3 " " " "	10
Total	93

Stow College of Engineering, Glasgow

1st Year (Course A)	66
2nd Year "	20
3rd Year "	13
Total	99

School of Engineering Burnbank, Hamilton

1st Year (Course A)	32
1st Year (Course B)	20
2nd Year (Course A)	21
3rd Year (Course A)	12
3rd Year (Course B)	9
Total	94

Ramsay Technical College, Portobello

1st Year (Course A)	13
1st Year (Course B)	53
1st Year (Elect.Fitting)	27
2nd Year " "	21
2nd Year (Course B)	24
Total	138

Falkirk Technical College

1st Year (Course B)	13
2nd Year (Course A)	10
Total	23

40 electrical craftsmen and trainees of the Fife Area of the South of Scotland Board also completed the forms by special arrangement, their details being:-

Apprentices	
2nd Year	7
3rd Year	6
4th Year	3
5th Year	5
Tradesmen	
Trained by S.S.E.B.	9
Trained elsewhere and recruited as tradesmen by S.S.E.B.	10
Total	40

APPENDIX 8 (contd.)

MECHANICAL ENGINEERING CRAFT PRACTICE

342 engineering students following the City and Guilds day release course in Mechanical Engineering Craft Practice except where otherwise stated.

M.S.E. = Machine Shop Engineering   M.E.T. = Mechanical Engineering Technician.

School of Engineering, Burnbank, Hamilton

1st Year	15
2nd Year	13
3rd Year	14
4th Year	16
4th Year (MSE)	11
5th Year (MSE)	2
02 (Production) Nat.Cert.	19
Total	90

Stow College of Engineering, Glasgow

1st Year	25
1st Year (MET)(Block Release)	14
2nd Year (Full-time)	15
4th Year (MET)	23
5th Year (MSE)	28
HNC Final Year (Production)	14
Total	119

Ramsay Technical College, Portobello

Pre-Apprenticeship (Full-time)	15
1st Year (MET)	12
2nd Year	12
2nd Year (MET)	20
3rd Year	10
Total	69

Esk Valley College, Midlothian

(All Mining Mechanical except where otherwise stated)

1st Year (Full-time)	13
2nd Year (Non-mining)	17
3rd Year (MET)(Non-mining)	7
3rd Year	6
4th Year	7
5th Year	1
ONC (Mining)	3
ONC (Straight Mechanical)	10
Total	64

The Mechanical Engineering Craft Practice Booklets were also completed by 34 Artificer Apprentices (aged 19 - 20) from the Royal Navy Establishment, H.M.S. Caledonia, Rosyth, Fife.

APPENDIX 9

CODING

Address i.e. Area (Location of College)

1 = Falkirk Technical College

2 = Stow College of Building, Glasgow

3 = Edinburgh School of Building

4 = Cambuslang School of Building (near Glasgow)

5 = Esk Valley College, Midlothian

6 = School of Engineering, Burnbank, Hamilton

7 = Ramsay Technical College, Portobello (near Edinburgh)

8 = Stow College of Engineering, Glasgow

9 = Royal Navy.

Secondary School attended before entering employment.

1 = Junior Secondary School (Secondary Modern)

2 = Senior Secondary School (Grammar)

3 = Comprehensive School

Type of Secondary School Course.

1 = Junior Secondary

2 = Senior Secondary

Class/

APPENDIX 9 (continued)

Class you were in at time of leaving school

0 = not known

1 = 2nd Year of Course

2 = 3rd Year of Course (including a few in 4th Year of Junior Secondary Course).

3 = 4th Year of Course (including some doing "O" Levels).

4 = 5th Year of Course.

State Whether Day Release or Evening Classes

1 = Day Release

2 = Block Release.

3 = Full time.

Class you are in at present

1 =	City and Guilds	1st Year	
2 =	"	2nd Year	
3 =	"	3rd Year	
4 =	"	4th Year	
5 =	"	5th Year	
6 =	"	7th Year*	
7 =	National Certificate	ONC:	S3 (Mining Electrical)
8 =	"	ONC	(Mining Electrical)
9 =	"	ONC	(Mechanical)
10 =	"	ONC:	02 (Production Engineering)
11 =	"	HNC	(Final Year) (Production Engineering)
12 =	"		01 (Mining Electrical).

* Full Technological Certificate Year.

Type of Course (e.g. City and Guilds, National Certificate)

1 = Carpentry and Joinery.

2 = Electrical Installation Course A.

3 = Electrical Installation Course B.

4 = Electrical Fitting.

5 = Mining Electrical Engineering.

6 = Mechanical Engineering Pre-Apprenticeship Course.

7 = Mechanical Engineering Craft Practice.

8 = Mechanical Engineering Technician.

9.= Mining Mechanical Engineering

10 = Machine Shop Engineering

11 = Production Engineering

12 = Admiralty Course

13 = Admiratly Course + ONC (Mechanical Engineering).

No. of Employees in Firm

0 = Don't Know

1 = 1 - 10

2 = 11 - 50

3 = 51 - 100

4 = 101 +

5 = Not yet employment (Pre-Apprentice).

How/

APPENDIX 9 (continued)

How employed:

Carpenters and Joinery

0 = Not recorded.

1 = General Building.

2 = Maintenance.

3 = Jobbing.

4 = Shop Fitting, Shop Work, etc.

5 = Ship's Joiner.

Mechanical Students.

0 = Not recorded.

1 = Production.

2 = Maintenance.

3 = Research and Development.

4 = Pro-Apprentices.

5 = Training School or Centre.

6 = Others.

Electrical Students.

0 = Not recorded.

1 = Production.

2 = Maintenance.

3 = Contracting)
Installation)
Construction)

4 = Electrical Fitting.

What/

What kind of job did you want on leaving school?

Carpenters and Joiners

0 = Not recorded.

1 = Carpentry and Joinery.

2 = Other building trade apprenticeship.

3 = Engineering Apprenticeship.

4 = Other Apprenticeship (Specified).

5 = Apprenticeship (unspecified).

6 = Other employment.

7 = Undecided.

Mechanical Students.

0 = Not recorded.

1 = Engineering (unspecified).

2 = Electrical Engineering.

3 = Electrician.

4 = Deaughtsman.

5 = Radio and T.V. Engineer.

6 = Motor Mechanic.

7 = Other Engineering Apprenticeship.

8 = Other Trade Apprenticeship

9 = Other Employment.

10 = Undecided.

Electrical/

Electrical Students.

0 = Not recorded.

1 = Electrician.

2 = Electrical Engineer.

3 = Engineer (unspecified).

4 = Draughtsman.

5 = Radio and T.V. Engineer.

6 = Motor Mechanic.

7 = Other Engineering Apprenticeship.

8 = Other Trade Apprenticeship.

9 = Other Employment.

10.= Undecided.

How did you obtain your apprenticeship?

Carpenters and Joiners.

0 = Unrecorded.

1 = Own Initiative.

2 = Friend or Relative.

3 = Employer's Initiative.

4 = Youth Employment Officer.

5 = Answered Advertisement.

6 = Written Application.

7 = School Teacher.

8 = School of Building

Mechanical/

Mechanical Students.

0 = Unrecorded.

1 = Own Initiative.

2 = Friend or Relative.

3 = Employer's Initiative.

4 = Youth Employment Service.

5 = Answered Advertisement.

6 = Written Application.

7 = Schoolteacher.

8 = School of Engineering.

Electrical Students.

0 = Unrecorded.

1 = Own Initiative.

2 = Friend or Relative.

3 = Employer's Initiative.

4 = Youth Employment Service.

5 = Answered Advertisement.

6 = Written Application.

7 = Schoolteacher.

8 = School of Engineering.

APPENDIX 10(a)

Survey of Three Craft Skills

Details of 268 Trainees and Tradesmen whose Answer Booklets

were analysed in respect of the Check List of Operations

(Carpenters and Joiners 66, Electricals 63, Mechanicals 139)

City and Guilds Day Release Course except where otherwise stated

No. of Students	Group	No. of Tradesmen	Completed years of Course
31	Carpentry and Joinery Students	31	4th - 18 5th - 13
35	Carpentry and Joinery Students	-	3rd
29	Electrical Students (NCB - 24, SSEB - 5)	29	5th - 15
	NCB Mining Electrical (Maintenance 24)		4th - 9
	SSEB Elect. Installation Course A (Contracting 5)		5th - 5
13	Electrical Students (Elect. Installation Course A)	2	3rd
	(Contracting 5, Maintenance 7, Shipbuilding 1)		
12	Electrical Students (Elect. Installation Course A)	1	3rd
	(Contracting 4, Maintenance 8)		
9	Electrical Students (Elect. Installation Course B)	2	3rd
	(Contracting 3, Maintenance 6)		
20	Machine Shop Engineering Students	20	5th
11	Mechanical Engineering Craft Practice Students	4	4th
14	Mechanical Engineering Craft Practice Students	1	3rd
14	Mechanical Engineering Technicians (Block Release)	-	3rd
19	Machine Shop Engineering Students	11	ONC : O2 Production
15	Experimental Course Students (Three Years Full-time)	-	2nd
12	Production Engineering Students	12	HNC (Final) Productior
34	Royal Naval Artificer Apprentices (Admiralty Course)	-	3rd - 32 4th - 2
268	Students of whom	113	Tradesmen

APPENDIX 10 (b)

Details of 711 answer booklets (326 carpentry and joinery, 385 electrical) punch-carded for computer analysis

326 Carpentry and Joinery Students

Centre*	Year	No. of Students	
1	1st	25	
2	"	29	
3	"	59	
4	"	25	
Total	1st Year		138
1	2nd	28	
2	"	31	
3	"	25	
4	"	20	
Total	2nd Year		104
1	3rd	35	
2	"	27	
3	"	22	
Total	3rd Year		84
	Grand Total		326

* Code as in Appendix 9, i.e.

1 = Falkirk Technical College

2 = Stow College of Building

3 = Edinburgh School of Building

4 = Cambuslang School of Building

APPENDIX 10 (b) (continued)

385 Electrical Students

179 Electrical Installation Course A Students

Centre*	Year	No. of Students	
6	1st	31	
7	"	13	
8	"	62	
Total	1st Year		106
1	2nd	10	
6	"	18	
8	"	20	
Total	2nd Year		48
6	3rd	12	
8	"	13	
Total	3rd Year		25
	Grand Total		179

103 Electrical Installation Course B Students

Centre*	Year	No. of Students	
1	1st	13	
6	"	20	
7	"	46	
Total	1st Year		79
7	2nd Year		24
	Grand Total		103

* see over

APPENDIX 10 (b) (continued)

38 Electrical Fitting Students

Centre*	Year	No. of Students
7	1st Year	26
7	2nd Year	12
	Grand Total	38

65 Mining Electrical Students

Centre*	Year	No. of Students
5	1st Year	11
5	2nd Year	25
5	3rd Year	29
	Grand Total	65

* Code as in Appendix 9, i.e.

1	=	Falkirk Technical College
5	=	Esk Valley College, Midlothian
6	=	School of Engineering, Burnbank, Hamilton
7	=	Ramsay Technical College, Portobello
8	=	Stow College of Engineering, Glasgow

Appendix 11 : Wimpey Muirhouse Site Labour Turnover

W = Working A = Absent T = Taken On L = Leaving

Date	Joiners				Bricklayers				Plant Drivers				Labourers			
	W	A	T	L	W	A	T	L	W	A	T	L	W	A	T	L
19th October 1962	15				1				5				36			
26th " "	15				2				4				34			
2nd November "	15				4				5				35			
9th " "	17		4		4				5				37		4	
16th " "	21		1		4				5				40			
23rd " "	21				4				8				39			
30th " "	24				4				8				39			
8th December "	32	3		1	6				10				39	2		4
21st " "	35	2			7			7	12				49	4		4
29th " "	40	6			7	2			13	3			48	6		
12th January 1963	43	3			10	2			12	1			59	5		
18th " "	43	1		9	12			6	15			2	59			23
25th " "	34	1			10	1			10				28			
26th " "	32	2			9	1			10				25	3		
28th " "	29	4	3		8	2			9	1			29		3	
29th " "	35	1	2		9	1	2		10				33		2	
30th " "	36	2			11	1	2		10				35		8	
31st " "	37	1			12	2			10				44			
1st February "	33	4		1	12	1			12				44			
2nd " "	32	5			12	1			11				39	4		1
4th " "	32	3			11	2	1		10	1			43	1	3	
5th " "	34	1			17	1	1		11	1			48	1		
6th " "	29	6			18	1			10	2			38	11		
7th " "	34	1			16	3			11	1			49			
8th " "	31	4			17	2			10	1			51			
11th " "	30	4			17	4			9	1			53			
15th " "	36	1			19	1			13				53	1	2	
19th " "	40	1			18	1			12	1			55	2		
20th " "	41				18	1			12	1			57	2		
21st " "	41				17	2			12	1			57	2		
22nd " "	39	2			17	2			12	2			55	4		
25th " "	39	2			16	2			13	1	1		50	8	1	
26th " "	42				17	1			13	2			56	4		
27th " "	41	1			17	1			13	2			55	5		
28th " "	42	2			16	2			13	3			57			
1st March "	45	1			16	2			12	3			57	3		
4th " "	40	2	3		15	3			15	1	1		53	5	4	1
5th " "	45				16	2	2		16	1	1		59	4		
6th " "	45				7	3			15	1			57	3		
7th " "	42	2			7	3			15	1			56	4		
8th " "	41	3			5	5			14	2			54	6		
11th " "	39	4	9		9	1			15	2			53	3	7	
12th " "	51	1	1		9	1			15	2			61	2	4	
13th " "	49	3			9	1			15	2			64	3		
14th " "	52				8	2			15	2			65	1		1
15th " "	50	3			8	2			15	2			64	2		
18th " "	49	4	5		10		2		16	1			59	3	11	
19th " "	53	2		1	12				15	2			73	4		
20th " "	57	2			11				15	1			74	4		
21st " "	59				11				16	1			73	3		
22nd " "	58	1			9	2			16	1			69	7		
25th " "	52	6	5		9				14	2	1		55	5	9	
26th " "	57	6	1		10				15	2			70	5	1	
27th " "	61	1		1	10				15	2			70	5	11	1
28th " "	60	2			10				15	1			73	4		
29th " "	57	5			9	1			14	2			72	5		
1st April "	58	3	2		9				12	1		1	69	7	12	
5th " "	55	4			9	1			13	1			79	6		
12th " "	57	3		1	11				13	2			91	10		
19th " "	54	3	3		14				13	1			87	7	4	
26th " "	59	4			15	1			15	1			96	9		

Date	Gangers				Plumbers				Steel Fixers				Fitters			
	W	A	T	L	W	A	T	L	W	A	T	L	W	A	T	L
19th October 1962	5				3				3				1			
26th " "	5				3				4				1			
2nd November "	5				3				3				1			
9th " "	5				3				3				1			
16th " "	5				3				4				1			
23rd " "	5				3				4				1			
30th " "	5				3				4				1			
8th December "	5	1		1	3	2			4	1			1			
21st " "	5				3				5	1			2			
29th " "	5				3				6	1			2			
12th January 1963	6				6				6	1			2			
18th " "	5				6				6			4	2			
25th " "	4				6				3				1			
26th " "	4				5	1			1	1			1			
28th " "	3	1			4	2			2		3		1			
29th " "	4	1			4	2			4	1			1			
30th " "	4	1			4	2			5				1			
31st " "	4	1			3	3			5				1			
1st February "	4				4				5				1			
2nd " "	2	2			3	1			5				1			
4th " "	4				4				4	1			1			
5th " "	3				4				5				1			
6th " "	3				3	1			5				1			
7th " "	3				3	1			5				1			
8th " "	3				4				5				1			
11th " "	3		1		4				5				1			
15th " "	6				2				5				1			
19th " "	4	1			4				5				1			
20th " "	5	1			4				5				1			
21st " "	5	1			3	1			5				1			
22nd " "	4	2			4				5				1			
25th " "	6				4				5				1			
26th " "	6				4				5				1			
27th " "	6				4				5				1			
28th " "	5	1			3				5				1			
1st March "	6				4				5				1			
4th " "	6				4				4	1			1			
5th " "	6				4				4	1			1			
6th " "	6				4				5				1			
7th " "	5	1			3	1			5				1			
8th " "	5	1			4		3		5				1			
11th " "	5	1			7		1		5		1		1			
12th " "	5	1			8				6				1			
13th " "	5	1			7	1			6				1			
14th " "	5	1			7	1			6				1			
15th " "	5	1			8				4				1			
18th " "	5	1			8				6				1			
19th " "	6				8				6				1			
20th " "	6			1	7				6	1			1			
21st " "	6				7	1			6				1			
22nd " "	6				8				6				1			
25th " "	5	1			7				6				1			
26th " "	5				7				6		1		1			
27th " "	6				7				7				1			
28th " "	6				6	1			7				1			
29th " "	6				7				7				1			
1st April "	6				7				6	1			1			
5th " "	5	1			7				6	1			1			
12th " "	7				7	1			6	1			1			
19th " "	6				9	1			7				1			
26th " "	5				9				7				1			

Date	Plasterers				Roughcasters				Sawyers				Painters			
	W	A	T	L	W	A	T	L	W	A	T	L	W	A	T	L
19th October 1962																
26th " "																
2nd November "																
9th " "																
16th " "																
23rd " "																
30th " "																
8th December "																
21st " "	6			1												
29th " "	6															
12th January 1963	7															
18th " "	2			8	1											
25th " "					1											
26th " "					1											
28th " "					1											
29th " "	1		6		1				1							
30th " "	7		2		1				1							
31st " "	10				1				1							
1st February "	10				1				1							
2nd " "	9	1			1					1						
4th " "	12				1					1						
5th " "	12				1					1						
6th " "	10	2			1					1					1	
7th " "	5				1					1			1			
8th " "	5				1					1			1			
11th " "	12				1				1				1			
15th " "	12				1								1			
19th " "	14				1				1				1			
20th " "	13				1				1				1			
21st " "	13				1				1				1			
22nd " "	13				1				1							
25th " "	14		1		1				1							
26th " "	15				1				1							
27th " "	15				1					1						
28th " "	14	1			1					1						
1st March "	14	1			1				1							
4th " "	11	3		1	1				1							
5th " "	12	2			1				1							
6th " "	13	2			1				1							
7th " "	14	1			1				1							
8th " "	14				1				1							
11th " "	15		2		1				1							
12th " "	17				1				1							
13th " "	16				1				1							
14th " "	15	1			1											
15th " "	15	1			1											
18th " "	13	2			1	1			1							
19th " "	13	2			2				1							
20th " "	13	2			2		1		1		1					
21st " "	13	2			2				2							
22nd " "	13	2			2				2							
25th " "	11	1	1		2				2							
26th " "	12	1			2				2							
27th " "	12	1			2				2							
28th " "	12	1			2				2							
29th " "	13	1			2				1	1						
1st April "	10	3	2		2				1	1						
5th " "	14	1							1	1			1			
12th " "	18	2							1	1						
19th " "	18								1	1			4			
26th " "	17				2				1	1			7			

Date	Electricians				Copper Roofers				Totals			
	W	A	T	L	W	A	T	L	W	A	T	L
19th October 1962	4								69			
26th " "	4								68			
2nd November "	3								72			
9th " "									75		8	
16th " "	4								83			
23rd " "	3				2				84			
30th " "	2				2				88			
8th December "	4				2				100	9		6
21st " "									124	7		12
29th " "	6				11				130	18		
12th January 1963	6				14				151	12		
18th " "									109		52	
25th " "	8				15				94	3		
26th " "									88	8		
28th " "					15				87	8	10	
29th " "					15				103	6	12	
30th " "					15				115	6	11	
31st " "					15				128	7	1	
1st February "	15				15				127	5		1
2nd " "					15				115	15		1
4th " "					15				122	9	4	
5th " "									136	5	1	
6th " "					14				118	26	1	
7th " "									129	7		
8th " "	15				13				129	8		
11th " "									137	7	1	
15th " "	16				15				149	3	2	
19th " "	16				14				155	7		
20th " "					15				159	5		
21st " "					15				157	7		
22nd " "	17				15				152	12		
25th " "					15				150	13	3	
26th " "					16				161	7		
27th " "					16				158	10		
28th " "					16				158	10		
1st March "	17				16				157	10		
4th " "					15				150	15	8	2
5th " "					16				164	10	3	
6th " "					16				154	9		
7th " "					1				149	12		
8th " "	17				16				144	17	3	
11th " "					18				151	11	20	
12th " "					18				175	7	5	
13th " "					18				174		11	
14th " "					18				176	8		1
15th " "	17				18				174	11	11	
18th " "					18				170	12	18	
19th " "					18				190	10		1
20th " "					18				194	10	2	1
21st " "					18				196	7		
22nd " "	17				18				190	13		
25th " "					18				174	15	16	
26th " "					18				188	14	3	
27th " "					18				193	9	11	2
28th " "					18				194	9		
29th " "	15				18				189	15		
1st April "					16				181	16	16	1
5th " "	17				18				191	16		
12th " "	17				16				212	20		1
19th " "	14				15				210	13	7	
26th " "	20				15				227	16		

Appendix 12 : Details of Activity Analysis Operations in Appendix 35

Squads	Key to Appendix 35		A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Y	Y	Z		
	Names	Number of Operator	Fixing or Erecting Material	Position and or Plumb Material	Measure Material or Posn. of Same	Cut Material	Mark Material	Talking About the Job	Absent From Job Position	Prefabricate Shutters	Collect Tools, Tidy-Up Etc.	Strip Shutters	Light and/or Stand at Fire	Look For and Collect Material	Move to Next Job	Move Material	Walking	Hold Material Being Cut	Load and Unload Material	Wait On or To Cut Material	Repair Shutters	Smoking	Day Release	Off Work	Supervise & Inspect	Watch Tradesman or Labourer	Miscellaneous Readings.	Miscellaneous Explanations	Totals
First Fixings	J. Moir C/H	1	5	3	8	1		6	4										1										28
	T. Smith App.	2	2	2	6	3		1	8								1		2					1		2			28
	J. Heron	3	7	12	2	2	1	1									1		1								1	Wind up Line	28
	W. Jeffrey App.	4	10	6		4	1	1	1														2			1	2	Door Wall	28
	P. Hunter	5	17	3	1	2		3			1									1									28
	T. Archibald	6	6	3	2	9	1	1			1				1									3			1	Sharpen Tools	28
	F. Bain	7	11	5	2	4		3	1						1												1	Door Wall	28
	J. Somerville App.	8	5	4		1		1	1	3					1				1				3	6		1	1	Door Wall	28
Floors	A. Lama C/H	9	9	1		1		10	1	3						2						1							28
	J. Sutherland	10	9		3	4		4		1				1								1							23
	J. Duncan	11	10			4	1	4		7			1			1													28
	R. Tumblty	12	10	5				3		7			1	1													1	Sharpen Tools	28
	J. Tait	13	10	5				4		1				1	2														23
	T. MacAlpine	14	8	1	1	1		3		1					2									6					23
	J. Morgan App.	15	12	2	1	1		4	3	1		2						1								1			28
Floors	J. S. McKenzie C/H	16	20	2	1	1		2	1	1																			28
	A. Lamond	17	20	1		1		2		3	1																		28
	J. Bishop	18	20			1		3		1	1							1				1							28
	A. Hastie	19	15			3		3	1	3	1			1												1			28
Stairs, Canopies & Floors	J. Dick C/H	20	14	2				6	1		2				1										1		1	Clean Material	28
	T. MacKay	21	15					5			2			1															23
	G. Skene	22	9	1		Drill 4		2	3	3	2				1					1							1	Standing	28
	L. Orde	23	12	5	1			2	1	2	2				1					1							1	Remove Nails	28
	G. Brown	24	12	2				3	3		1									1						1			23
Walls	W. Rogers C/H	25	11	2				4	4			1							1					1	4				28
	J. Yorke	26	14	2		1		4		5		1															1	Fix Material To Crane	28
	D. Hastie	27	15	2				2		2		6															1	Fix Material To Crane	28
	R. McKenzie	28	16	1				1		1		3				1													23
Edge Beams & Walls	P. Hill C/H	29	12	1				3	2	5		3				1						1							23
	W. Peacock	30	9					5		4	3	3				2					2								28
	J. Hogg	31	11	1				3			2	3			1	1					2			4					28
	J. Campbell App.	32	9					2	3	1	4	2			2	1							4						28
	G. Palmer C/H	33	9	1		4		3	3		1		1														1	Repair Elect. Saw Plug	23
	J. Brownhill	34	9	2	1			4	2		2		1					1								1			23
	G. Hogg	35	12	7		3		1	1				1			1											2	Chip Ice (1) Climb up Scaffold (1)	28
		36	13	5		5							1			1	1	1									1	Climb up Scaffold	28
	ns	37	18	1	1	1		3		1			1			1						1							28
	se	38	12		3	6		3					1				1					1							28
	J. Docherty	39	12	3		2		1	1				1	1		1		1											23
	J. Playfair App.	40	7						7				3	3		1	1					1							23
	W. Bruce App.	41	5	1		2			4		1		3	3		1	1						5			2			28
	E. Campbell	42		1		1						2			1														5
	Totals		462	95	33	73	4	116	57	56	27	26	15	12	14	15	6	5	6	4	4	7	14	21	5	10	16		1103

Snowing

Working = 977 = 88.5%
Not Working = 126 = 11.5%
1103 = 100 %

$L = 2\sqrt{\frac{P(100-P)}{N}}$ ∴ $L = 2\sqrt{\frac{88.5 - 11.5}{N}}$ ∴ $N = 1018$ ∴ Enough Readings Were Taken

APPENDIX 13

Name: . . . . Today's Date . . . .

Age: Years . . . . . . Months . . . . Date of Birth . . . .

Address: . . . .

School: . . . . Father's Occupation . . . .

What job does your father want you to do? . . . .

What job does your mother want you to do? . . . .

Name your first, second and third choice of employment:-

1. ____________________________

2. ____________________________

3. ____________________________

Below is a list of some of your school subjects. Indicate with a tick opposite each subject whether or not you think it would be useful to you in the job you want when you leave school:-

Subject	Useful	Not Useful
English		
History		
Geography		
Arithmetic		
Mathematics		
Science		
Art		
Music		
Physical Education		
Technical Subjects		

The same subjects are listed again below. Number them in order of preference putting 1 against the subject you like best, 2 against the subject you like second best, and so on, until you have numbered all the subjects:-

Subject	Order of Preference
English	
History	
Geography	
Arithmetic	
Mathematics	
Science	
Art	
Music	
Physical Education	
Technical Subjects	

Below is a list of industries in which people work. Put the number 1 against the industry which in your opinion would offer the best skilled training and prospects to a 15 year old boy leaving school and looking for a craft apprenticeship. Put the number 2 against the second best industry and so on, until you have numbered all the industries in order from 1 to 20:-

Industry	No
Agriculture	
Bricks, Pottery, Glass, Cement	
Chemicals	
Clothing and Footwear	
Construction/Building	
Distributive Trades	
Electrical Goods	
Electrical Supply	
Engineering	
Gas Supply	
H.M. Forces	
Metal Manufacture	
Mining	
Paper, Printing & Publishing	
Railways	
Road Transport	
Shipbuilding	
Textiles	
Timber, Furniture	
Vehicle Manufacture	

APPENDIX 13 (continued)

In each of the following lists number the jobs in order of skill according to your opinion, putting 1 opposite the most skilled type of work, 2 opposite the next most skilled type of work, and so on:-

Building Crafts:

Type of Work	No.
Carpenter & Joiner	
Bricklayer	
Plasterer	
Plumber	
Painter & Decorator	
Stonemason	
Roof Tiler	
Glazier	
Electrician	
Heating & Ventilation Engineer	
Gas Fitter	

Engineering:

Type of Work	No.
Aeronautical Engineer	
Civil Engineer	
Production Engineer	
Electrical Engineer	
Electronics Engineer	
Heating & Ventilation Engineer	
Marine Engineer	
Mechanical Engineer	
Mining Engineer	
Radio & T.V. Engineer	

Electrical Work:

Type of Work	No.
Contracting	
Maintenance	
Installation	
Shipbuilding	
Electrical Fitting	
Construction	
Production	

APPENDIX 14 (a)

Name . . . . To-day's Date: . . . .

Age: Years . . . . Months . . . . Date of Birth . . . .

Date of Starting Apprenticeship . . . .

Date of Completion of Apprenticeship . . . .

Type of Further Education Course being followed . . . .

Class you are in at present . . . .

State whether Day Release, Block Release, or Full-Time . . . .

Name and Address of Present Firm . . . .

. . . .

Date you joined present Firm . . . .

How employed . . . .

Below is a list of industries in which people work. Put the number 1 against the industry which in your opinion would offer the best skilled training and prospects to a 15 year old boy leaving school and looking for a craft apprenticeship. Put the number 2 against the second best industry and so on, until you have numbered all the industries in order from 1 to 20:-

Industry	No.
Agriculture	
Bricks, Pottery, Glass, Cement	
Chemicals	
Clothing and Footwear	
Construction/Building	
Distributive Trades	
Electrical Goods	
Electrical Supply	
Engineering	
Gas Supply	
H.M. Forces	
Metal Manufacture	
Mining	
Paper, Printing & Publishing	
Railways	
Road Transport	
Shipbuilding	
Textiles	
Timber, Furniture	
Vehicle Manufacture	

In each of the following lists number the jobs in order of skill according to your opinion, putting 1 opposite the most skilled type of work, 2 opposite the next most skilled type of work, and so on:-

Building Crafts:

Type of Work	No.
Carpenter and Joiner	
Bricklayer	
Plasterer	
Plumber	
Painter and Decorator	
Stonemason	
Roof Tiler	
Glazier	
Electrician	
Heating and Ventilation Engineer	
Gas Fitter	

Engineering:

Type of Work	No.
Aeronautical Engineer	
Civil Engineer	
Production Engineer	
Electrical Engineer	
Electronics Engineer	
Heating and Ventilation Engineer	
Marine Engineer	
Mechanical Engineer	
Mining Engineer	
Radio and T.V. Engineer	

Electrical Work:

Type of Work	No.
Contracting	
Maintenance	
Installation	
Shipbuilding	
Electrical Fitting	
Construction	
Production	

APPENDIX 14 (b)

Name . . . . To-day's Date: . . . .

Age: Years . . . . Months . . . . Date of Birth . . . .

Date of Starting Apprenticeship . . . .

Date of Completion of Apprenticeship . . . .

Type of Further Education Course being followed . . . .

Class you are in at present . . . .

State whether Day Release, Block Release, or Full-Time . . . .

Name and Address of Present Firm . . . .

. . . .

Date you joined present Firm . . . .

How employed . . . .

Below is a list of industries in which people work. Put the number 1 against the industry which in your opinion would offer the best skilled training and prospects to a 15 year old boy leaving school and looking for a craft apprenticeship. Put the number 2 against the second best industry and so on, until you have numbered all the industries in order from 1 to 20:-

Industry	No.
Agriculture	
Bricks, Pottery, Glass, Cement	
Chemicals	
Clothing and Footwear	
Construction/Building	
Distributive Trades	
Electrical Goods	
Electrical Supply	
Engineering	
Gas Supply	
H.M. Forces	
Metal Manufacture	
Mining	
Paper, Printing & Publishing	
Railways	
Road Transport	
Shipbuilding	
Textiles	
Timber, Furniture	
Vehicle Manufacture	

14(b)

APPENDIX 14(b) (continued)

In each of the following lists number the jobs in order of skill according to your opinion, putting 1 opposite the most skilled type of work, 2 opposite the next most skilled type of work, and so on:-

Building Crafts:

Type of Work	No.
Carpenter & Joiner	
Bricklayer	
Plasterer	
Plumber	
Painter & Decorator	
Stonemason	
Roof Tiler	
Glazier	
Electrician	
Heating & Ventilation Engineer	
Gas Fitter	

Specialist Operatives:

Type of Work	No.
Glazed Wall Tiler	
Partition Fixer	
Dry Liner	
Floor Layer	
Lagger	
Faience Fixer	
Curtain Waller	
Felt Roofer	
Fencer	
Scaffolder	

Other Operatives:

Type of Work	No.
Ganger	
Chargehand	
Banksman	
Crane Driver	
Concrete Finisher	
Plant Driver	
Bricklayers Labourer	
Painters Labourer	
General Labourer	

APPENDIX 14 (c)

Prestige Ratings

Table 1 : 70 boys

Third Year non-language pupils studying technical subjects and due to leave school at the end of June, 1966 on attaining the age of 15.

Job Choice. (February 1966)

Mechanical, Motor Mechanic, Engineer, Fitter, Turner	22
Electrician	9
Services	6
Farming, etc.	4
Police Force	4
Panel Beater	3
Bricklayer	3
Joiner	3
Coachbuilding	1
Draughtsman	1
Painter	1
Laboratory work	1
Miscellaneous	12
Total	70

Table 2/

Table 2 : 70 boys

Ratings for school subjects regarding a) usefulness in relation to job wanted and b) liking for school subjects

Subject	Usefulness	Liking	d	d^2
Mathematics	1	5	-4	16
Arithmetic	2	4	-2	4
Technical Subjects	3	1	2	4
English	4	2	2	4
Science	5	6	-1	1
Physical Education	6	3	3	9
Art	7	7	0	0
Geography	8	8	0	0
History	9	9	0	0
Music	10	10	0	0
			7	38

$$P = 1 - \frac{6\Sigma(d^2)}{n(n^2-1)}$$

$$= 1 - \frac{6 \times 38}{990}$$

$$= .77 \qquad t = p\sqrt{\frac{n-2}{1-p^2}} = .7= .77\sqrt{\frac{8}{1-(.77)^2}}$$

$$= 3.41$$

Correlation between ratings for usefulness in job and liking for subject is significant (t value corresponding to a probability p = 0.05)

Table 3/

APPENDIX 14 (c) (continued)

Table 3 : Prestige Ratings for Industries

Industry	1	2	3	4	5	6	7
Engineering	1	2	2	1	1	1	1
Electrical Goods	2	6	5	5½	3	9	7
Electrical Supply	3	3	3	5½	7	2	2
Vehicle Manufacture	4	7	4	4	5	4	3½
H. M. Forces	5	5	6	15	10	5	5
Chemicals	6	1	1	3	2	3	3½
Construction / Building	7	4	7	2	6	7	9½
Shipbuilding	8	8	14	8	18	6	9½
Metal Manufacture	9	11	8½	7	4	18	8
Timber, Furniture	10	9	18	10	17	15	13
Gas Supply	11	12	11	12	11	11	11
Paper, Printing, etc.	12	10	10	11	13	8	6
Bricks, Pottery, etc.	13	15	13	17	16	16	16
Distributive Trades	14	17	12	14	12	14	19
Road Transport	15	18	9	19	19	16	18
Textiles	16	13	8½	9	15	10	12
Railways	17	20	20	20	9	12	15
Agriculture	18	14	15	13	14	18	20
Mining	19	16	16½	16	8	13	14
Clothing and Footwear	20	19	16½	18	20	20	17

1 = 70 Boys (Pupils)
2 = 102 Joiners
3 = 54 Clerks etc.
4 = 14 Roadworkers
5 = 18 B.Sc. Building
6 = 12 B.Sc. Mechanical
7 = 29 B.Sc. Electrical

Correlation/

Correlation of Column 2 with Column 1

$$d^2 = 138 \qquad P = 1 - \frac{6\Sigma(d^2)}{n(n^2-1)}$$

$$= .89$$

$$t = p\sqrt{\frac{n-2}{1-p^2}} = .89\sqrt{\frac{18}{1-(.89)^2}} = 8.27$$

Correlation is significant.

Correlations of Columns 3, 4, 5, 6 and 7 with Column 1 and with each other may be similarly calculated and are generally significant.

Table 4 : Prestige Ratings of Building Crafts

(a)	1	2	3	4	5	6	7
Heating and Ventilation Engineer	1	3	2	3	3	3	3
Carpenter and Joiner	2	1	3	1½	2	2	2
Electrician	3	2	1	1½	1	1	1
Stonemason	4	4	4	4	5	8	4
Gas Fitter	5	5	5	8	7	5	6
Glazier	6	10	7	10	11	11	9
Plumber	7	7	8	5	4	4	5
Bricklayer	8	8	10	6	6	7	11
Painter and Decorator	9	6	6	7	9½	6	7
Plasterer	10	9	11	9	8	9	8
Roof Tiler	11	11	9	11	9½	10	10

1 = 70 Boys (Pupils)
2 = 102 Joiners
3 = 54 Clerks. etc.
4 = 14 Roadworkers
5 = 18 B.Sc. Building
6 = 12 B.Sc. Mechanical
7 = 29 B.Sc. Eledtrical

Correlation/

Correlation of Column 2 with Column 1

$$d^2 = 32 \qquad P = 1 - \frac{6\Sigma(d^2)}{n(n^2-1)} = .8$$

$$t = p\sqrt{\frac{n-2}{1-p^2}} = .8\sqrt{\frac{9}{1-.64}} = 4.0$$

Correlation is significant.

Correlations of Columns 3, 4, 5, 6 and 7 with Column 1 and with each other may be similarly calculated and are generally significant.

Table 4 : Prestige Ratings of Specialist Operatives (Building)

(b)	4	5
Glazed Wall Tiler	1	2
Scaffolder	2	8
Partition Fixer	3	5
Floor Layer	4	3
Felt Roofer	5	6
Faience Fixer	6	4
Dry Liner	7	7
Curtain Waller	8	1
Fencer	9	10
Lagger	10	9

4 = 14 Roadworkers

5 = 18 B.Sc. Building

Correlation of Column 5 with Column 4

$$d^2 = 96\tfrac{1}{2} \qquad P = 1 - \frac{6\Sigma(d^2)}{n(n^2-1)} = .56$$

$$t = P\sqrt{\frac{n-2}{1-p^2}} = .56\sqrt{\frac{8}{1-(.56)^2}} = 1.904$$

Correlation is not significant.

Table 4 : Prestige Ratings of Other Operatives (Building)

(c)	4	5
Ganger	1	1
Chargehand	2	3
Plant Driver	3	4
Crane Driver	4	2
Concrete Finisher	5	5
Banksman	6	6
Bricklayer's Labourer	7	7
Painter's Labourer	8	8
General Labourer	9	9

4 = 14 Roadworkers

5 = 18 B.Sc. Building

Correlation of Column 5 with Column 4

Correlation is significant (ranking almost identical)

Table 5 : Prestige Ratings of Engineering Work

	1	2	3	6	7
Aeronautical	1	1	1	2	2
Electronics	2	2	2	1	1
Radio and TV	3	6	6	10	8
Electrical	4	3	3	4	3
Mechanical	5	7	7	3	4
Marine	6	5	4	5	6
Civil	7	4	5	7	5
Heating and Ventilating	8	8	9	9	9
Production	9	10	10	6	7
Mining	10	9	8	8	10

1 = 70 Boys (Pupils)

2 = 102 Joiners

3 = 54 Clerks etc.

6 = 12 B.Sc. Mechanical

7 = 29 B.Sc. Electrical

Correlation/

Correlation of Column 2 with Column 1

$$d^2 = 26 \qquad P = 1 - \frac{6\Sigma(d^2)}{n(n^2-1)} = .84$$

$$t = P\sqrt{\frac{n-2}{1-p^2}} = 4.368$$

Correlation is significant

Correlation of Column 6 ($d^2 = 70$) with Column 1 is not significant but that of Column 7($d^2 = 38$) with Column 1 is.

Table 6 : Prestige Ratings of Electrical Worlk

	1	2	3	6	7
Electrical Fitting	1	1	3	5	2½
Installation	2	2	1	3½	2½
Maintenance	3	6	4	6	7
Construction	4	4	2	2	1
Shipbuilding	5	5	6	3½	6
Contracting	6	3	5	7	4½
Production	7	7	7	1	4½

n is too small for correlation tables.

APPENDIX 15

Area X

(Approximately 800 leavers per annum : 400 boys, 400 girls)

15 Year Old School-leavers Leaving School in July, 1965

50 boys : Random Sample

Code

Column 6
- A = YEO essentially in agreement with pupil's job choice
- D = YEO in disagreement with pupil's job choice

Column 8
- S = Job entered same as job wanted
- D = Job entered different from job wanted

Column 9
- O = Job entered same (or approximately same) skill level as job wanted
- + = Job entered more highly skilled than job wanted
- − = Job entered less highly skilled than job wanted

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
1	28.5.50	108	Printer's Asst.	Printer's Asst.	A	Printer's Asst.	S	O
2	18.5.50	100	App. Butcher	Practical/Social	A	App. Butcher	S	O
3	3.2.50	77	App. Plumber	Building App. in small firm.	A	Petrol Pump Attendant	D	−
4	23.1.50	98	Miner or Bricklayer	Practical/ Active	A	Farm Work	D	−
5	20.5.50	105	App. Motor Mech.	Practical/ Skilled	A	Shop Asst.	D	−
6	20.7.50	99	App. Electrician	Apprenticeship	A	Grocer's Shop	D	−
7	22.2.50	113	App. Motor Mech.	Outdoor/Active/ Skilled	A	App. Panel Beater	D	−
8	7.1.50	83	App. Electrician	Practical/Semi-Skilled/Active	D	Van Boy	D	−

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1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
9	28.3.50	93	App.Motor Mech.	Skilled App.,e.g. Motor Mech.	A	App,Motor Mech.	S	O
10	19.5.50	108	Army App.	Practical/Skilled/ Active	A	Army Royal Eng.	S	O
11	24.7.50	87	App.Plasterer	Active/Practical	A	App. Steel Erector	D	O
12	26.5.50	85	Van Boy	Practical/Semi-skilled	D	Machine Boy	D	+
13	19.5.50	70	App. Joiner or Painter	Practical Work	A	App. Joiner	S	O
14	27.4.50	79	App. Butcher or Grocer	Practical,social, active, e.g. Butcher Shop	A	App. Butcher	S	O
15.	4.4.50	100	Farm Work	Farm Work	A	Farm Work	S	O
16	8.5.50	112	Army Catering Corps. (Butchers Trade	Army ditto.	A	App.Butcher	S	O
17	24.3.50	97	App.Electrician	Skilled app.	A	App. Motor Mech.	D	O
18	6.1.50	100	App.Motor Mech.	Skilled app.	A	App. Storeman	D	O
19	28.1.50	99	App. Joiner	App. Joiner	A	App. Cabinet-maker	D	O
20	20.6.50	87	App. Painter or Joiner	Bldg. Trade	A	App. Bricklayer/ Mason	D	O
21	20.4.50	108	App. Joiner	Pre. App Course - Bldg.	A	App. Plumber	D	O
22	7.7.49	89	Farm Work	Farm Work	A	Farm Work	S	O
23	28.2.50	93	Sales Asst., Grocer's	Figures/Social e.g. Sales Asst.	A	Sales Asst.	S	O
24	10.3.40	87	Farm Work	Farm Work	A	Farm Work	S	O
25	14.4.50	98	App.Elec-trician	Skilled App.	A	Yard Boy, R.N.A.D.(Storeman later)	D	O

APPENDIX 15 (continued).

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
26	10.7.50	70-	Painting	Active/Practical e.g. semi-skilled factory work	D	Labourer	D	-
27	25.6.49	102	App. Joiner	App. Plasterer	D	App. Plasterer	D	-
28	16.12.48	96	App. Electrician	Bldg. App. e.g. Joiner	D	App. Turner	D	0
29	30.10.49	92	Sawmills	Unskilled outdoor job	A	App. Miner	D	+
30	7.10.49	72	Farming	Farming	A	Message Boy	D	-
31	31.1.49	82	Bldg Trade	Bldg. Trade	A	App. Joiner	S	0
32	16.10.49	98	Merchant Navy Catering Branch	ditto	A	Merchant Navy Catering Branch	S	0
33	5.2.50	113	Merchant Navy	ditto, depending on bronchitis	A	Dyer's Asst.	D	0
34	31.1.50	89	App. Motor Mech.	Artistic/Semi-skilled e.g. App. Printer in small firm.	D	Petrol Pump Attendant	D	-
35	3.2.50	70-	App. Plasterer	Practical Semi-or Unskilled e.g. Van Boy, Factory Work	D	Factory Worker	D	-
36	8.1.50	90	Shop Asst	Active/Social e.g. Grocer's shop	A	Shop Asst.	S	0
37	23.2.50	94	Pre-App. Bldg. Course	Practical skilled e.g. App. NCB/ REME	A	Bakery (Co-op)	D	-
38	29.6.50	80	Panel Beating or Bldg. Work	Active/Practical e.g. App. Bricklayer	A	Labourer	D	-

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APPENDIX 15 (continued)

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
39	11.4.50	95	App. Joiner	Active/Practical e.g. App. Bldg. Trade	A	R.N., 2nd Rating	D	O
40	26.7.50	96	M.N. or R.N.	Social/Practical/ Figures e.g. stores Work, Office	D	App. Storeman	D	O
41	10.6.50	104	Sales Asst., Butcher or Grocer	Figs/Artistic Sales Asst./ Grocery	A	App. Butcher	S	O
42	20.1.50	76	App. Painter	Practical, Active, e.g. semi-skilled work	D	Van Boy	D	-
43	9.5.50	84	Something outdoors	Outdoor work - Forestry, Farm-work	A	Labourer	S	O
44	21.1.50	80	A trade of some kind	Practical, semi-skilled e.g. bricklayer.	A	App. Slater	S	O
45	15.3.50	122	Office Work	Words and Fig-ures-clerical, storeman	A	Clerk	S	O
46	30.4.50	95	Bldg. Trade	Practical e.g. Bldg. Trade - Bricklaying etc.	A	App. Bricklayer	S	O
47	3.5.50	70-	Coachpainter	Practical semi-unskilled - paint-spraying/ factory.	A	Coachpainter	S	O
48	7.2.50	91	Joiner or Mech.	Trade	A	App. Motor Mech.	S	O
49	29.1.50	99	App. Painter & Pro. Footballer	Active/Skilled Bldg. App. Painter/Joiner	A	Labourer	D	-
50	8.2.50	83	A trade of some kind	Bldg. Trade like Bricklaying, practical, semi-skilled.	A	Factory sugar boiler.	D	-

APPENDIX 16

Area Y

(Approximately 1360 leavers : 740 boys, 620 girls)

15 Year Old School-leavers leaving school in July, 1965

50 boys : Random Sample

Code

Column 6 { A = YEO essentially in agreement with pupil's job choice
D = YEO in disagreement with pupil's job choice }

Column 8 { S = Job entered same as job wanted
D = Job entered different from job wanted }

Column 9 { O = Job entered same (or approximately same) skill level as job wanted
+ = Job entered more highly skilled than job wanted
− = Job entered less highly skilled than job wanted }

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
1	21.11.49	102	Wood Machinist	Wood Machinist	A	Process Worker	D	O
2	30.10.49	112	Apprenticeship	Eng. App.	A	App. Turner	S	O
3	31.1.49	97	Office	Office	A	Office	S	O
4	21.8.49	117	Office	Office	A	Office	S	O
5	19.7.50	99	Elect. Eng.	App. Elect.	A	App. Elect.	S	O
6	8.1.50	80	App.Mech or TV Mech.	Semi skilled	D	Shop Asst.	D	−
7	4.6.50	76	Joiner	Semi-skilled-sawmills.	D	Labourer	D	−
8	7.6.50	96	Trailor Boy, Driver's Mate, Miner	Van boy, Miner	A	Coremaker	D	+

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APPENDIX 16 (continued)

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
9	24.12.49	98	Mech.Eng.	Eng/Fitter/ Turner	A	Chemical Plant Operator	D	-
10	10.4.50	93	Motor Mech.	Perhaps Bldg. App.	D	General Work, Wholesale Grocer	D	-
11	22.8.50	73	App. Joiner	App. Joiner if poss. or semi-skilled.	A	Pre-App. Dockyard	S	O
12	29.6.50	80	Joiner	Simple repetitive manual-factory, foundry, mill.	D	Labourer	D	-
13	13.6.50	105	Shop/Bldg. Trade	Shop/Bldg. Trade	A	Shop Asst.	S	O
14	19.1.50	89	App. Coach-Builder.	App. Coach-Builder.	A	App. Motor Mech.	D	O
15	29.3.50	111	Electrician	Trade	A	Truck Driver's mate..	D	-
16	14.10.49	78	Paper Mill	Simple routine	A	Milk Boy	D	O
17	7.8.50	93	Brickworker	ditto	A	Labourer	S	O
18	23.7.50	88	Joiner	Grocer, Shop Asst.	D	Grocer	D	-
19	29.9.49	93	Plumber, Painter	Painter, Plumber	A	App. Elect.	D	O
20	9.3.50	93	Coachpainter/ sprayer	ditto	A	Driver's Mate	D	-
21	13.7.50	70	Painter	Factory, foundry, sawmill	D	Tea boy, Power Stn.	D	-
22	2.6.49	104	Apprenticeship	ditto	A	Steel Fixer	D	-
23	12.8.50	78	Joiner	Simple training-butcher, grocer.	D	App. Butcher	D	-
24	15.12.48	104	Motor Mech.	ditto	A	Motor Mech.	S	O

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APPENDIX 16 (continued)

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
25	16.1.50	91	Electrician	Foundry, brick-works	D	App. Electrician	S	O
26	24.2.50	95	Gardener	ditto	A	Labourer	D	-
27	2.4.50	70-	Petrol Pump attendant	Unskilled work	A	Van boy	D	O
28	27.6.48	108	Electrician, Fitter, Joiner	Bldg. Trade	A	App. Brick-layer	D	-
29	24.5.50	99	Electrician or Motor Mech.	App. or Services	A	Pre-App. Dockyard, Plater's boy.	D	-
30	3.6.50	96	Radio/TV Mech., Electrician	Painter, Semi-skilled	D	App. Joiner	D	O
31	22.3.50	95	Joiner	Bldg. Trade Course	A	Stockroom Boy, Woolworth	D	-
32	21.3.50	70	Van Boy (milk)	Simple, routine, practical Grocer, butcher, etc.	A	Labourer	D	O
33	26.1.50	88	Merchant Navy (catering)	Grocer, butcher etc. for one year then M.N.	A	App. butcher	D	O
34	29.6.50	96	Motor Mech	App. Motor Mech.	A	App. Motor Mech	S	O
35	23.3.50	92	Motor Mech.	Bldg. App.	D	App. Fitter	D	O
36	2.6.50	76	Farm Work	Farm Work	A	Farm Work	S	O
37	28.5.50	93	Painter	Painter, Slater	A	Labourer	D	-
38	4.5.50	93	Not sure - Army	Services	A	App. Joiner	D	O
39	2.8.49	97	Bldg. Trade	ditto	A	App. Gas Fitter	D	O
40	19.8.50	100	Coachbuilder	App. Bldg. Course	A	App. Eng.	D	O

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APPENDIX 16 (continued).

1 Pupil	2 Date of Birth	3 I.Q.	4 Job Wanted by Pupil	5 Job Recommended by YEO	6	7 Job Actually Entered	8	9
41	4.3.50	98	Instrument Mech.	Bldg. Trade	D	Garage Storeman	D	-
42	8.3.50	92	Welder	Apprenticeship	A	Labourer	D	-
43	14.5.49	99	Engineer (Fitter)	Fitter, Turner, Elect.	A	App. Sheet-metal Worker	D	-
44	5.7.50	70-	Van Boy	Simple, repetitive, manual-factory, mill, foundry	A	Labourer	D	0
45	26.7.49	75	R.N.	ditto	A	Labourer	D	-
46	18.9.49	107	Motor Mech.	Appenticeship	A	App. Engineer Dockyard.	S	0
47	13.8.49	97	Electrician, Engineer	ditto	A	Electrician	S	0
48	31.7.50	107	Joiner, Motor Mech.	Pre-App. Bldg. Course	A	App. Naval Air Mech.	D	+
49	16.3.49	90	Engineer	Apprenticeship	A	App. Motor Mech.	S	0
50	17.1.49	86	Coachbuilder	ditto	A	Van Boy	D	-

APPENDIX 17(a)

Area X

Summary of all vacancies for boys

on Youth Employment Register, 9.3.66

Office / Clerical	4	Roadworker (several)	
Bank Trainee	2	Temporary Telegraph Boy, GPO	2
Apprentice Painter	4	Labourer	8
" Civil Engineer	1	Van Boy / Message Boy	3
" Coachpainter	1	Farm Worker	1
" Baker	1	Tyre Fitter	1
" Slater/Plasterer	1	Petrol Pump attendant	1
" Electrician	1	Kitchen Work	1
" Glazier	1	Junior Waiter	2
" Bricklayer	1	Shop Assistant	6
" Joiner	2		
" Panel Beater	1		
" Motor Mechanic	1		
Storeman	1		
Commis Chef or Trainee Cook	1		

Approximately 51 vacancies

Skilled vacancies 23 = 45%

Semi and unskilled vacancies 28 = 55%

APPENDIX 17(b)

Area Y

Summary of all vacancies for boys

on Youth Employment Register, 3.3.66

Office / Clerical	3	Bacon Curer	1
App. Plumber	1	Baker	1
" Pattern maker	1	Concrete Labourer (several)	1
" Electrical Engineer	1	Trainee Roadworker (several)	1
" Plasterer	2	Van Boy (several)	1
" Fitter	1	Brewery Worker (several)	1
" Weighing Machine Mech.	1	Tyre Fitter	1
" Joiner	1	Hotel Porter	1
" Welder	1	Farm Work	2
" Moulder (several)	1	Garden Nursery Work	1
" Metal Polisher	2	Labourers (several)	1
" Coremaker	1	Drop Hammer Driver (several)	1
" Blacksmith	1	Butcher's Shop	2
" Photographer	1	Grocer's Shop	7
Male Nurse (several)	1	Gent's Outfitter	2

Approximately 60 vacancies

Skilled vacancies 24 = 40%

Semi and unskilled vacancies 36 = 60%

APPENDIX 17(c)

Entry into Employment of Boys leaving School : By Occupation

Period 1.10.63 to 30.9.64

Areas X and Y

	Area X	Area Y	Total
Offices, Banks etc.	24	69	93
Shops, Van Boys, Delivery etc.	84	126	210
Building Trades	47	87	134
Agriculture, etc.	29	31	60
Professions (Accountancy, Surveying, Draughtsmen etc.)	23	41	64
Industry (mainly apprenticeship)	86	204	290
Industry (labourers)	14	115	129
National Coal Board	7	4	11
Miscellaneous	50	64	-
	364	741	1105

APPENDIX 18

1. Name . . . . Age . . . .

2. Underline qualifications obtained at Heriot-Watt College or elsewhere.
   (a) Higher National Certificate . . . .
   (b) City and Guilds:
      (i) Full Technological . . . .
      (ii) Final . . . .
      (iii) Intermediate . . . .

3. Have you continued your studies since gaining the H.N.C? . . . .
   (If so, give details and dates.)

Subjects Studied	Session	Qualifications Gained or aimed at

4. Employment history to date since leaving school:-

Name of Organisation	Dates during which Employed		Nature of Appointment	Reason for Leaving	Comments on Usefulness of Experience
	From	To			

5. How did you obtain your present post?
   (e.g. Friend or relative spoke for you; applied on own initiative; Approached by Employer; Assisted by College.)

. . . .

6. By putting a tick in the appropriate column, comment on the usefulness of each of the subjects which you studied at Heriot-Watt College, among these listed below, in relation to your career in the Building Industry.

Subjects	A	B	C	D	E
Building Technology					
Quantity Surveying					
Structural Design					
Building Science					
Estimating for Builders' Work					
Supervision and Specification					
Building Geometry					
Mathematics					
Any other subjects) ______					
______					
______					
______					

A - Very Useful
B - Useful
C = Of average assistance
D = Not very useful
E - Of no use at all

7. Have you any suggestions to make in the light of your own experience regarding the training of future students to meet the needs of the industry:-

8. Any additional comments you wish to make:-

APPENDIX 19

1. Name . . . . Age . . . .

2. Underline Qualifications obtained at Heriot-Watt College, or elsewhere.

   (a) Higher National Diploma
   Special Mention if any . . . . . .

   (b) Associateship:- 1st Class, 2nd Class, Pass.

   (c) Other qualifications if any . . . .
   . . . .

3. Give details of studies since leaving college. (If nil, please state so.)

Subjects Studied	Session	Qualifications Gained or Aimed at

4. Employment history from the time you left school until you entered the Heriot-Watt College.

Name of Organisation	Dates during which Employed		,Nature of Appointment	Reason for Leaving	Comments on Usefulness of Experience
	From	To			

5. Details of vacational employment during the years you attended College:-

Name of Organisation	Dates during which Employed		Nature of Appointment	Comments on Usefulness of Experience
	From	To		

6. What type of job did you want on leaving College?

. . . .

7. Employment history since you left Heriot-Watt College:-

Name of Organisation	Dates during which Employed		Nature of Appointment	Reason for Leaving	Comments on Usefulness of Experience
	From	To			

8. How did you obtain your present post?
(e.g. Friend or relative spoke for you; College appointments service; Applied on own initiative.)

. . . .

APPENDIX 19 (contd.)

9. By putting a tick in the appropriate columns, comment on the usefulness of each of the subjects which you studied at Heriot-Watt College, among these listed below, in relation to your career in the Building Industry. (A = Very useful, B - Useful, C = Of average assistance, D = Not very useful, E = Of no use at all.)

Subject	A	B	C	D	E	Subject	A	B	C	D	E
Building Technology						Management Practice					
Quantity Surveying						and Procedure					
Sanitary Science						Work Study					
Concrete Technology						Accountancy					
Structural Design						Office Administration					
Mechanics						Building Law					
Surveying and Levelling						Economics of Industry					
Heating and Ventilating						Geology					
Building Science						Mathematics					
Estimating for Builders'						Physics					
Work						Chemistry					
Supervision and						Contractor's Plant					
Specification						History of Building					

10. In order to prepare Associateship and Diploma students for the Building Industry, have you any suggestions to make in the light of your own experience regarding:-

    (a) Studies at the Heriot-Watt College:

    (b) The types of practical experience to seek or avoid at the different stages in the students training. (e.g. during vacation; before College; after qualifying, etc.)

11. Any other comments you wish to make which might be helpful in the career planning of future Building students at the Heriot-Watt College:-

APPENDIX 20

Check List of Operations

268 Students (Carp. 66, Elect. 63, Mech. 139)

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

City and Guilds Day Release Course except where otherwise stated.

Sub-Appendix No.	Group	No. of Trades-men	Completed years of Course
Carp. (1)	31 Carpentry and Joinery Students	31	4th - 18 5th - 13
Carp. (2)	35 Carpentry and Joinery Students	-	3rd
Elect. (1)	29 Electrical students (NCB-24, SSEB-5) N.C.B. Mining Electrical (Maintenance 24) S.S.E.B. Elect. Installation Course A (Contracting 5)	29	5th - 15 4th - 9 5th - 5
Elect. (2)	13 Electrical Students (Elect. Installation Course A) (Contracting 5, Maintenance 7, Shipbuilding 1)	2	3rd
Elect. (3)	12 Electrical Students (Elect.Installation Course A) (Contracting 4, Maintenance 8)	1	3rd
Elect. (4)	9 Electrical Students (Elect. Installation Course B) (Contracting 3, Maintenance 6)	2	3rd
Mech. (1)	20 Machine Shop Engineering Students	20	5th
Mech. (2)	11 Mechanical Engineering Craft Practice Students	4	4th
Mech. (3)	14 Mechanical Engineering Craft Practice Students	1	3rd
Mech. (4)	14 Mechanical Engineering Technicians (Block Release)	-	3rd
Mech. (5)	19 Machine Shop Engineering Students	11	ONC : O2 Production
Mech. (6)	15 Experimental Course Students (Three Years Full-time)	-	2nd
Mech. (7)	12 Production Engineering Students	12	HNC (Final) Production
Mech. (8)	34 Royal Naval Artificer Apprentices (Admiralty Course)	-	3rd - 32 4th - 2

Carp. (1)

31 Carpentry and Joinery students having completed or nearly completed Apprenticeship (average age 20) and having completed 4th Year (18 students) or 5th Year (13 students) of City and Guilds Course.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	0	0	44	2	0	87	20	15	130	0	10
2	0	0	45	8	3	88	29	16	131	0	12
3	3	2	46	7	6	89	28	16	132	22	10
4	0	0	47	2	5	90	26	16	133	24	17
5	0	0	48	0	0	91	27	19	134	16	6
6	0	0	49	0	0	92	22	20	135	24	8
7	0	0	50	0	4	93	30	20	136	28	18
8	0	1	51	10	6	94	30	20	137	29	20
9	0	0	52	1	3	95	15	10	138	29	20
10	7	6	53	3	6	96	20	9	139	25	13
11	9	11	54	0	9	97	23	9	140	26	9
12	9	12	55	8	1	98	23	9	141	30	18
13	5	13	56	7	3	99	22	17	142	30	20
14	3	0	57	1	2	100	20	17	143	31	19
15	12	5	58	1	1	101	22	18	144	30	16
16	3	0	59	4	0	102	28	14	145	18	16
17	15	14	60	1	0	103	30	14	146	7	15
18	21	14	61	8	1	104	30	14	147	1	5
19	11	14	62	6	3	105	26	16	148	0	12
20	4	6	63	7	3	106	31	19	149	6	12
21	5	3	64	4	0	107	27	18	150	1	12
22	3	3	65	1	0	108	31	18	151	1	11
23	15	13	66	3	14	109	30	17	152	3	19
24	18	17	67	0	15	110	30	17	153	5	20
25	20	18	68	0	13	111	26	17	154	6	21
26	19	21	69	4	1	112	5	1	155	12	21
27	22	21	70	14	4	113	5	9	156	5	5
28	11	9	71	15	5	114	9	9	157	7	6
29	13	16	72	10	7	115	7	5	158	15	15
30	6	15	73	5	6	116	8	6	159	29	13
31	10	16	74	22	5	117	6	10	160	16	13
32	12	17	75	13	4	118	7	16	161	7	14
33	6	14	76	1	7	119	13	9	162	5	6
34	9	11	77	7	11	120	10	7	163	14	5
35	1	0	78	4	5	121	10	8	164	8	3
36	8	10	79	6	9	122	15	18	165	31	16
37	2	3	80	7	8	123	10	17	166	31	17
38	0	1	81	18	7	124	25	19	167	30	15
39	0	0	82	27	7	125	11	18	168	28	15
40	0	0	83	29	7	126	4	4	169	25	17
41	9	0	84	14	10	127	4	9	170	20	21
42	20	3	85	17	12	128	2	12	171	23	18
43	10	0	86	22	14	129	1	6	172	29	11

APPENDIX 20

Carp.(2)

35 Carpentry and Joinery students having nearly completed 3rd year of City and Guilds Course.

O = Operation No.
W = No. of students not having done operation at work.
C = No. of students not having done operation at classes.

O	W	C	O	W	C	O	W	C	O	W	C
1	0	1	44	8	5	87	18	27	130	8	22
2	1	3	45	12	11	88	27	29	131	10	23
3	3	11	46	9	16	89	22	30	132	25	30
4	1	1	47	8	14	90	21	28	133	25	32
5	0	0	48	1	1	91	26	28	134	17	19
6	0	0	49	0	2	92	20	26	135	21	26
7	2	1	50	3	18	93	20	27	136	24	28
8	0	0	51	1	19	94	18	27	137	27	30
9	0	3	52	0	6	95	21	13	138	30	32
10	5	11	53	2	21	96	14	19	139	19	29
11	4	11	54	5	21	97	16	19	140	20	28
12	4	14	55	9	3	98	17	18	141	30	31
13	1	5	56	4	3	99	18	21	142	30	31
14	0	11	57	10	6	100	20	21	143	29	31
15	7	3	58	10	7	101	21	21	144	30	31
16	4	2	59	13	11	102	28	19	145	24	30
17	5	9	60	5	4	103	30	21	146	16	30
18	2	11	61	8	3	104	31	21	147	1	15
19	3	16	62	16	8	105	22	22	148	2	20
20	4	7	63	19	14	106	30	30	149	10	19
21	6	7	64	11	12	107	28	27	150	4	26
22	2	5	65	3	2	108	27	24	151	4	24
23	7	12	66	11	27	109	27	29	152	6	30
24	15	24	67	8	23	110	30	27	153	8	30
25	15	22	68	8	24	111	28	25	154	16	32
26	19	25	69	7	14	112	12	12	155	21	32
27	23	28	70	13	15	113	11	19	156	9	26
28	10	22	71	15	18	114	11	18	157	20	28
29	11	19	72	7	12	115	11	17	158	21	28
30	4	15	73	14	16	116	10	20	159	18	18
31	5	15	74	14	20	117	9	20	160	14	18
32	8	23	75	6	17	118	12	23	161	7	11
33	7	18	76	2	18	119	15	17	162	13	18
34	10	18	77	12	23	120	13	17	163	14	14
35	6	4	78	8	18	121	15	17	164	13	17
36	6	18	79	15	22	122	19	24	165	30	30
37	3	8	80	14	20	123	10	25	166	32	32
38	0	4	81	23	18	124	20	28	167	30	30
39	1	5	82	25	14	125	9	24	168	29	31
40	14	6	83	28	27	126	5	15	169	29	32
41	23	18	84	15	25	127	11	25	170	27	32
42	15	14	85	20	28	128	9	22	171	31	32
43	4	6	86	20	25	129	6	21	172	30	32

APPENDIX 20

Elect.(1)

29 Electrical Tradesmen (24 Mining Electrical and 5 Electrical Installation) having completed 5th Year (25 students) or midway through 4th Year (4 students) of City and Guilds Course.

O = Operation No.
W == No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	0	0	34	0	1	67	4	6	100	8	1
2	1	2	35	2	0	68	1	3	101	9	2
3	0	15	36	4	3	69	0	2	102	2	4
4	2	6	37	3	0	70	0	2	103	5	10
5	1	4	38	7	2	71	5	4	104	6	3
6	1	6	39	18	20	72	3	8	105	12	3
7	2	14	40	3	6	73	4	6	106	9	3
8	2	11	41	2	3	74	5	2	107	5	5
9	1	8	42	1	2	75	1	2	108	5	8
10	1	0	43	2	2	76	7	15	109	2	7
11	1	6	44	4	8	77	13	22	110	2	4
12	3	4	45	2	5	78	15	25	111	3	3
13	5	9	46	1	2	79	11	3	112	3	3
14	2	8	47	2	4	80	15	22	113	3	5
15	0	3	48	2	6	81	6	11	114	5	3
16	3	1	49	4	3	82	20	20	115	9	4
17	5	4	50	4	3	83	13	2	116	6	4
18	6	8	51	4	6	84	2	7	117	5	9
19	5	5	52	2	6	85	1	7	118	5	2
20	3	3	53	3	9	86	0	3	119	4	1
21	4	2	54	6	9	87	0	4	120	5	0
22	1	0	55	2	3	88	3	7	121	4	1
23	6	5	56	0	2	89	0	2	122	14	5
24	13	14	57	8	17	90	0	2	123	4	3
25	2	1	58	12	12	91	4	4	124	2	2
26	9	13	59	9	12	92	12	8	125	3	3
27	2	2	60	8	11	93	12	20	126	7	9
28	10	8	61	9	16	94	6	3	127	18	22
29	6	7	62	11	18	95	6	4	128	18	23
30	14	16	63	10	17	96	9	3	129	17	22
31	6	4	64	10	18	97	6	3	130	21	23
32	0	1	65	6	9	98	1	4			
33	0	1	66	4	5	99	1	4			

Footnote : City and Guilds Electrical Installation Work, Course A
Operations 1 to 39 = First Year City and Guilds
Operations 40 to 82 = Second Year City and Guilds
Operations 83 to 130 = Third Year City and Guilds

APPENDIX 20

Elect.(2)

13 Electrical Students (Contracting 5, Maintenance 7, Shipbuilding 1) having completed the 3rd Year of the City and Guilds Electrical Installation Course A.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes.

O	W	C	O	W	C	O	W	C	O	W	C
1	0	2	34	0	0	67	8	17	100	8	0
2	7	0	35	0	0	68	2	8	101	7	0
3	12	12	36	5	0	69	2	7	102	5	2
4	1	6	37	6	2	70	3	7	103	7	8
5	0	0	38	9	3	71	11	12	104	8	3
6	0	5	39	8	0	72	11	12	105	7	0
7	4	5	40	2	6	73	10	13	106	8	3
8	2	2	41	0	4	74	9	3	107	9	5
9	0	1	42	0	3	75	2	7	108	8	7
10	0	0	43	0	3	76	5	5	109	4	6
11	0	4	44	3	8	77	8	7	110	6	7
12	0	1	45	0	8	78	5	7	111	5	3
13	0	5	46	0	7	79	11	1	112	3	5
14	4	7	47	0	8	80	8	9	113	3	7
15	2	4	48	4	5	81	3	6	114	5	5
16	6	2	49	0	4	82	6	0	115	8	8
17	0	3	50	1	5	83	1	10	116	10	11
18	6	0	51	0	6	84	4	4	117	9	10
19	1	2	52	1	6	85	1	4	118	4	0
20	2	4	53	3	7	86	1	4	119	6	0
21	5	0	54	0	7	87	3	3	120	9	1
22	1	0	55	5	3	88	4	4	121	6	4
23	2	5	56	4	3	89	4	3	122	5	4
24	4	1	57	5	3	90	6	5	123	2	4
25	0	0	58	6	6	91	7	4	124	0	3
26	4	4	59	6	7	92	3	3	125	1	6
27	1	1	60	7	5	93	8	12	126	3	7
28	3	3	61	8	9	94	8	4	127	10	11
29	0	0	62	6	8	95	7	5	128	8	10
30	3	3	63	6	9	96	7	2	129	8	6
31	0	2	64	6	9	97	6	0	130	6	0
32	0	0	65	8	12	98	2	7			
33	0	0	66	7	13	99	1	6			

Footnote : As per footnote to Appendix 20, Elect.(1).

APPENDIX 20

Elect.(3)

12 Electrical Students (Contracting 4, Maintenance 8) having completed the 3rd Year of the City and Guilds Electrical Installation Course A

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	1	3	34	1	3	67	1	11	100	3	2
2	0	7	35	1	2	68	2	10	101	6	2
3	6	5	36	8	9	69	1	10	102	0	5
4	0	1	37	6	2	70	3	11	103	1	10
5	0	9	38	4	9	71	8	11	104	1	3
6	1	1	39	4	1	72	7	11	105	3	6
7	5	11	40	3	6	73	9	9	106	2	2
8	2	9	41	0	3	74	9	12	107	5	7
9	1	7	42	0	5	75	2	10	108	4	7
10	0	0	43	0	4	76	3	11	109	1	5
11	0	8	44	5	11	77	4	11	110	1	3
12	0	3	45	0	11	78	7	12	111	2	4
13	2	1	46	0	8	79	8	5	112	1	6
14	4	10	47	1	5	80	7	9	113	0	8
15	0	10	48	0	6	81	1	10	114	4	6
16	3	4	49	4	6	82	7	2	115	7	6
17	6	6	50	1	7	83	3	9	116	7	9
18	5	3	51	1	7	84	2	7	117	5	11
19	3	0	52	0	11	85	0	11	118	2	3
20	2	1	53	4	11	86	0	7	119	0	5
21	2	3	54	4	11	87	2	9	120	0	5
22	2	1	55	0	10	88	3	12	121	3	4
23	4	3	56	0	10	89	0	4	122	4	9
24	6	6	57	0	10	90	2	9	123	0	6
25	1	1	58	1	5	91	5	11	124	1	7
26	9	10	59	2	5	92	8	11	125	1	7
27	1	0	60	0	11	93	5	10	126	1	7
28	7	10	61	0	12	94	3	4	127	8	11
29	0	0	62	0	12	95	1	3	128	7	11
30	4	3	63	0	11	96	4	3	129	4	10
31	1	2	64	1	12	97	1	3	130	4	1
32	1	5	65	4	12	98	1	2			
33	0	2	66	3	12	99	0	4			

Footnote : As per footnote to Appendix 20, Elect.(1).

APPENDIX 20

Elect.(4)

9 Electrical Students (Contracting 3, Maintenance 6) having completed the 3rd year of the City and Guilds Electrical Installation Course B.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes.

O	W	C	O	W	C	O	W	C	O	W	C
1	0	5	34	0	0	67	2	7	100	4	3
2	0	5	35	0	2	68	4	6	101	3	3
3	3	5	36	3	5	69	1	5	102	0	6
4	0	0	37	3	4	70	2	7	103	1	8
5	1	0	38	4	6	71	6	7	104	1	5
6	0	1	39	4	2	72	5	7	105	1	5
7	3	5	40	1	6	73	4	7	106	0	3
8	3	8	41	0	3	74	6	7	107	2	6
9	1	7	42	0	3	75	1	7	108	2	6
10	0	0	43	0	4	76	1	7	109	0	4
11	0	1	44	0	4	77	4	7	110	0	6
12	0	1	45	0	3	78	4	6	111	0	3
13	1	0	46	0	2	79	6	4	112	0	4
14	2	2	47	0	3	80	3	7	113	1	5
15	2	5	48	1	4	81	0	7	114	3	7
16	2	3	49	0	3	82	6	4	115	2	6
17	0	0	50	0	3	83	3	5	116	1	4
18	3	2	51	0	3	84	2	4	117	4	8
19	1	4	52	1	6	85	0	4	118	0	4
20	0	1	53	0	4	86	0	4	119	0	4
21	0	1	54	0	5	87	2	5	120	4	4
22	2	1	55	0	2	88	4	7	121	6	6
23	4	2	56	2	3	89	0	4	122	1	4
24	4	3	57	4	6	90	1	5	123	0	5
25	0	1	58	7	6	91	1	7	124	0	6
26	4	7	59	4	3	92	5	6	125	0	5
27	2	1	60	4	5	93	5	6	126	0	7
28	4	3	61	4	8	94	2	3	127	4	6
29	0	2	62	4	8	95	3	1	128	4	8
30	3	1	63	4	7	96	4	2	129	4	7
31	0	0	64	4	8	97	1	3	130	7	3
32	0	1	65	3	5	98	0	7			
33	0	3	66	2	6	99	0	7			

Footnote : As per footnote to Appendix 20, Elect.(1).

APPENDIX 20

Mech. (1)

20 Machine Shop Engineering students, all tradesmen, having completed 5th Year of City and Guilds Course.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C
1	0	1
2	1	1
3	0	2
4	1	1
5	0	1
6	1	6
7	2	3
8	6	8
9	3	3
10	1	2
11	1	1
12	0	2
13	1	8
14	0	10
15	2	7
16	2	6
17	5	6
18	2	1
19	2	3
20	6	10
21	1	3
22	2	6
23	3	12
24	2	1
25	9	2
26	9	4
27	6	13
28	10	13
29	10	13
30	11	10
31	12	10
32	15	11
33	12	12
34	0	1
35	0	0
36	0	1
37	0	2
38	0	2
39	0	1
40	0	0

O	W	C
41	1	1
42	0	0
43	0	6
44	0	4
45	1	1
46	1	0
47	0	0
48	0	0
49	1	0
50	0	2
51	0	0
52	0	0
53	0	3
54	3	2
55	1	1
56	1	1
57	0	0
58	0	1
59	0	0
60	0	0
61	0	0
62	0	2
63	1	1
64	2	0
65	5	7
66	2	3
67	1	2
68	1	5
69	10	3
70	2	13
71	5	13
72	2	9
73	3	11
74	2	10
75	3	10
76	4	12
77	2	6
78	1	6
79	8	4
80	10	1

O	W	C
81	8	1
82	9	1
83	8	1
84	9	1
85	1	11
86	2	6
87	1	0
88	0	2
89	0	2
90	10	4
91	3	6
92	2	2
93	1	3
94	9	9
95	13	15
96	14	14
97	11	15
98	14	13
99	8	13
100	2	4
101	3	4
102	5	6
103	4	4
104	3	3
105	4	5
106	0	1
107	1	1
108	1	1
109	5	1
110	0	1
111	1	2
112	0	2
113	2	2
114	0	2
115	0	2
116	3	2
117	1	2
118	4	5
119	2	7
120	4	3
121	4	4
122	4	5

O	W	C
123	5	7
124	5	5
125	4	2
126	6	6
127	4	4
128	3	5
129	3	3
130	3	2
131	4	4
132	4	5
133	3	4
134	3	3
135	4	2
136	0	7
137	2	9
138	3	10
139	0	11
140	4	10
141	5	9
142	3	9
143	1	10
144	1	9
145	1	10
146	1	8
147	13	7
148	13	7
149	12	5
150	13	6
151	13	5
152	13	5
153	5	13
154	5	12
155	5	13
156	4	14
157	7	13
158	5	13
159	4	11
160	4	11
161	9	14
162	9	15

APPENDIX 20

Mech. (1) contd.

O	W	C
163	3	13
164	2	13
165	3	3
166	3	4
167	4	6
168	4	4
169	3	5
170	6	9
171	6	10
172	5	9
173	4	9
174	2	5
175	2	4
176	6	10
177	6	10
178	7	6
179	4	4
180	6	5
181	4	3
182	7	6
183	4	2
184	3	2
185	6	3
186	4	5
187	0	0
188	2	2
189	6	6
190	2	1
191	1	4
192	0	1
193	2	2
194	4	6
195	2	3
196	11	11
197	12	9
198	10	10
199	11	10
200	10	9
201	9	10
202	14	14
203	12	14
204	11	13
205	11	13
206	13	14
207	11	14
208	11	14
209	11	12
210	9	9

O	W	C
211	7	8
212	9	9
213	7	10
214	9	11
215	8	7
216	8	6
217	8	9
218	10	11
219	7	6
220	9	7
221	8	6
222	8	10
223	3	14
224	10	17
225	10	16
226	10	17
227	8	18
228	6	16
229	7	17
230	10	17
231	9	17
232	9	11
233	11	12
234	10	11
235	9	7
236	10	9
237	8	5
238	4	4
239	9	13
240	9	12
241	9	12
242	10	10
243	10	12
244	7	10
245	6	10
246	6	12
247	6	10
248	7	11
249	7	13
250	8	12
251	10	10
252	10	9
253	12	13
254	11	12

O	W	C
255	7	10
256	8	11
257	8	9
258	9	10
259	8	12
260	8	11
261	8	9
262	8	10
263	8	11
264	10	14
265	11	15
266	9	13
267	10	16
268	8	10
269	10	13
270	7	12
271	6	17

APPENDIX 20

Mech. (2)

11 Mechanical Engineering Craft Practice students having completed 4th Year of City and Guilds Course.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C
MECP Part I 1st Year C & G		
1	4	1
2	0	0
3	1	0
4	0	1
5	1	2
6	2	2
7	2	4
8	7	9
9	4	4
10	0	0
11	1	0
12	1	1
13	0	0
14	0	0
15	1	0
16	1	0
17	3	6
18	0	0
19	1	1
20	3	5
21	1	2
22	1	2
23	1	1
24	1	0
25	1	1
26	2	0
27	5	5
28	4	6
29	4	5
30	5	2
31	6	1
32	6	3
33	5	1
34	0	0
35	1	1
36	1	0
37	2	1
38	0	1
39	2	0
40	1	0
41	1	0
42	1	0
43	3	2
44	3	2
45	1	0
46	0	0
47	1	0
48	1	0
49	2	0
50	1	3
51	2	5
52	2	0
53	2	0
54	3	5
55	3	2
56	3	2
57	3	0
58	2	0
59	3	0
60	3	1
61	3	0
62	3	0
MECP Part I 2nd Year		
63	1	0
64	0	0
65	2	3
66	3	5
67	1	0
68	0	0
69	1	2
70	3	3
71	2	3
72	0	0
73	2	1
74	3	4
75	0	1
76	2	3
77	1	0
78	2	0
79	4	3
80	4	2
81	4	2
82	6	6
83	2	1
84	3	2
85	2	2
86	0	0
87	1	1
88	1	0
89	0	0
90	3	3
91	2	2
92	0	1
93	0	0
94	3	2
95	4	5
96	5	5
97	4	4
98	6	5
99	3	4
100	0	0
101	0	0
102	1	2
103	3	3
104	2	0
105	0	1
106	3	1
107	2	2
108	3	1
109	3	3
110	2	0
111	1	0
112	2	1
113	1	0
114	1	1
115	2	0
116	2	2
117	3	4
118	4	6
119	2	4
120	3	1
121	0	2
122	0	1
123	3	5
124	3	3
125	1	0
126	1	2
127	1	0
128	1	5
129	1	3
130	0	0
131	2	1
132	1	0
133	2	0
134	2	4
135	1	0
MECP Part II 1st Year		
136	0	0
137	1	1
138	4	3
139	2	3
140	5	4
141	5	5
142	1	2
143	0	2
144	1	3
145	1	3
146	1	3
147	5	3
148	5	4
149	6	5
150	6	7
151	7	4
152	7	4
153	2	3
154	1	3
155	3	4
156	3	4
157	2	2
158	1	2
159	2	3
160	1	3
161	2	3
162	3	4
163	1	4
164	2	4
165	1	3

APPENDIX 20

Mech. (2) contd.

O	W	C
166	1	1
167	1	0
168	1	0
169	1	2
170	3	2
171	3	2
172	2	2
173	2	2
174	2	1
175	1	0
176	5	5
177	5	5
178	4	3
179	3	3
180	4	3
181	4	3
182	4	4
183	3	3
184	2	1
185	5	5
186	3	2
187	3	2
188	4	2
189	5	4
190	4	2
191	3	2
192	4	3
193	5	5
194	4	3
195	5	5
196	5	6
197	5	6
198	4	6
199	5	5
200	4	6
201	2	3

O	W	C
202	3	4
203	2	4
204	4	5
206	4	6
207	6	6
208	5	6
209	4	5
210	3	1
211	3	2
212	4	3
213	4	3
214	4	2
215	2	2
216	2	2
217	2	1
218	2	2
219	2	2
220	3	3
221	3	2
222	3	3
223	1	3
MECP Part II 2nd Year		
224	4	5
225	4	6
226	5	5
227	4	5
228	2	4
229	3	5
230	2	7
231	4	6
232	3	1
233	3	2
234	5	4
235	5	4
236	4	2

O	W	C
237	5	4
238	4	3
239	5	3
240	5	4
241	5	6
242	4	4
243	5	5
244	1	1
245	3	1
246	3	2
247	3	2
248	3	5
249	3	5
250	3	6
251	5	5
252	6	4
253	5	5
254	4	3
255	2	0
256	1	1
257	1	0
258	2	3
259	1	2
260	1	3
261	1	2
262	3	2
263	2	1
264	2	1
267	3	4
268	5	7
269	4	4
270	3	2
271	4	2

Footnote : City and Guilds Mechanical Engineering Craft Practice Course

Operations 1 to 62 = 1st Year, Part I, First Year
Operations 63 to 135 = 2nd Year, Part I, Second Year
Operations 136 to 222 = 3rd Year, Part II, First Year
Operations 223 to 271 = 4th Year, Part II, Second Year

APPENDIX 20

Mech.(3)

14 Mechanical Engineering Craft Practice Students having completed the 3rd year of the City and Guilds Mechanical Engineering Craft Practice Course.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	2	0	41	2	2	81	12	2	121	4	2
2	0	0	42	2	0	82	12	2	122	4	2
3	0	0	43	1	1	83	12	2	123	4	3
4	0	0	44	2	1	84	12	2	124	4	3
5	0	1	45	4	0	885	2	6	125	4	2
6	2	2	46	4	1	86	4	1	126	5	3
7	3	3	47	2	0	87	3	2	127	7	2
8	5	7	48	2	0	88	2	2	128	6	3
9	2	4	49	2	0	89	5	1	129	4	3
10	1	0	50	2	1	90	10	5	130	3	4
11	0	0	51	3	2	91	5	4	131	6	5
12	0	0	52	2	0	92	3	2	132	3	4
13	1	0	53	5	2	93	3	3	133	3	4
14	1	0	54	5	4	94	8	5	134	5	5
15	1	0	55	4	3	95	10	8	135	4	2
16	0	1	56	5	3	96	10	8	136	1	3
17	3	3	57	3	1	97	10	6	137	2	4
18	1	0	58	4	0	98	9	7	138	5	6
19	1	0	59	4	0	99	10	8	139	4	7
20	3	4	60	4	0	100	1	1	140	6	5
21	1	1	61	4	0	101	1	1	141	7	4
22	2	4	62	5	0	102	4	3	142	3	3
23	1	0	63	3	0	103	4	3	143	6	7
24	0	0	64	2	1	104	1	1	144	8	6
25	8	1	65	2	2	105	2	0	145	3	6
26	6	7	66	3	3	106	3	1	146	2	5
27	7	7	67	2	0	107	5	4	147	8	6
28	8	8	68	2	0	108	3	2	148	7	6
29	8	7	69	2	0	109	7	5	149	8	6
30	7	5	70	3	1	110	3	0	150	9	6
31	5	3	71	4	5	111	4	1	151	7	6
32	9	4	72	2	3	112	3	1	152	7	5
33	7	4	73	3	2	113	4	2	153	5	6
34	1	0	74	4	7	114	4	1	154	5	5
35	1	0	75	3	3	115	5	1	155	7	6
36	4	4	76	4	5	116	2	1	156	3	3
37	0	0	77	4	0	117	3	5	157	5	6
38	1	0	78	3	0	118	4	7	158	5	7
39	1	0	79	10	3	119	5	5	159	5	8
40	2	1	80	10	1	120	4	3	160	5	9

O	W	C	O	W	C	O	W	C	O	W	C
161	9	10	201	5	9	241	8	9			
162	8	11	202	8	10	242	8	7			
163	4	13	203	7	9	243	8	7			
164	5	14	204	8	8	244	8	6			
165	6	6	205	7	11	245	7	8			
166	4	6	206	7	7	246	7	7			
167	4	6	207	7	7	247	7	8			
168	3	6	208	7	8	248	7	8			
169	4	6	209	7	8	249	7	8			
170	4	8	210	8	8	250	7	6			
171	5	8	211	6	6	251	8	7			
172	5	8	212	7	7	252	9	8			
173	4	8	213	6	6	253	8	8			
174	5	3	214	6	8	254	5	6			
175	4	4	215	4	5	255	6	9			
176	5	8	216	4	5	256	7	10			
177	7	8	217	5	5	257	6	7			
178	6	7	218	7	7	258	7	8			
179	6	6	219	6	3	259	7	9			
180	7	4	220	6	5	260	7	9			
181	7	4	221	7	6	261	7	7			
182	7	5	222	7	5	262	7	6			
183	7	5	223	2	3	263	7	6			
184	5	4	224	7	9	264	6	8			
185	8	6	225	7	10	265	7	8			
186	6	5	226	8	9	266	7	8			
187	4	4	227	6	9	267	9	6			
188	7	6	228	6	10	268	7	5			
189	8	7	229	7	10	269	7	6			
190	7	5	230	6	9	270	6	5			
191	8	6	231	5	10	271	5	3			
192	7	5	232	8	7						
193	6	4	233	7	8						
194	8	6	234	7	9						
195	9	7	235	7	10						
196	9	7	236	7	10						
197	7	6	237	7	10						
198	7	8	238	6	7						
199	7	8	239	6	9						
200	7	7	240	6	9						

Footnote : City and Guilds Mechanical Engineering Craft Practice Course.

Operations 1 to 62 = 1st Year, Part I, First Year
Operations 63 to 135 = 2nd Year, Part I, Second Year
Operations 136 to 222 = 3rd Year, Part II, First Year
Operations 223 to 271 = 4th Year, Part II, Second Year

APPENDIX 20

Mech. (4)

14 Mechanical Engineering Technicians having completed 3rd Year MET City and Guilds Course.
All 14 employed by Rolls Royce Ltd., Hillington, Glasgow. (Block Release)

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C
1	0	5
2	0	11
3	0	10
4	0	14
5	0	12
6	10	14
7	3	12
8	8	14
9	5	13
10	1	6
11	0	10
12	0	4
13	0	6
14	0	13
15	0	5
16	2	9
17	7	14
18	0	3
19	0	5
20	6	14
21	0	9
22	5	14
23	0	15
24	0	3
25	6	2
26	6	2
27	13	11
28	14	12
29	12	11
30	14	11
31	14	12
32	14	12
33	14	12

O	W	C
34	0	6
35	5	7
36	1	9
37	1	8
38	2	10
39	3	10
40	5	11
41	5	12
42	0	8
43	3	11
44	3	11
45	5	5
46	5	5
47	4	1
48	5	1
49	5	0
50	5	9
51	7	9
52	3	1
53	5	8
54	8	11
55	5	7
56	6	11
57	5	3
58	5	0
59	5	2
60	5	1
61	5	6
62	5	10
63	1	6
64	6	7
65	10	11
66	11	11

O	W	C
67	1	5
68	0	6
69	0	6
70	6	11
71	8	14
72	0	11
73	3	12
74	12	14
75	10	13
76	4	13
77	0	13
78	0	14
79	10	5
80	13	5
81	14	3
82	13	3
83	13	3
84	12	3
85	9	11
86	6	4
87	6	11
88	2	13
89	2	12
90	14	7
91	10	11
92	5	14
93	0	14
94	12	7
95	14	14
96	14	12
97	13	11
98	14	13
99	11	8

O	W	C
100	4	5
101	7	14
102	13	14
103	11	12
104	6	12
105	9	11
106	5	5
107	8	8
108	5	4
109	13	10
110	5	3
111	5	7
112	6	8
113	10	10
114	5	1
115	5	1
116	7	6
117	12	14
118	11	14
119	10	14
120	0	6
121	1	5
122	1	14
123	3	13
124	4	10
125	0	8
126	0	14
127	0	13
128	0	14
129	1	13
130	3	12
131	0	9
132	1	10

APPENDIX 20

Mech. (4) contd.

O	W	C
133	1	11
134	6	13
135	0	8
136	6	14
137	11	14
138	11	14
139	13	14
140	10	14
141	11	14
142	2	13
143	13	14
144	11	13
145	11	14
146	8	13
147	11	9
148	11	8
149	11	8
150	11	10
151	11	12
152	11	12
153	11	13
154	10	13
155	11	14
156	6	14
157	14	14
158	14	14
159	10	14
160	9	14
161	13	14
162	13	13
163	7	12
164	13	14
165	10	11
166	7	8

O	W	C
167	8	11
168	6	9
169	10	13
170	7	14
171	10	14
172	8	14
173	9	14
174	5	11
175	5	2
176	6	11
177	10	11
178	10	11
179	9	11
180	8	13
181	5	14
182	8	14
183	11	12
184	5	6
185	11	10
186	15	14
187	5	4
188	5	6
189	9	10
190	6	6
191	9	10
192	5	7
193	13	8
194	10	10
195	6	8
196	14	14
197	13	13
198	13	13
199	13	13
200	13	13

O	W	C
201	13	13
202	14	14
203	14	14
204	10	14
205	13	14
206	10	14
207	10	14
208	13	14
209	8	14
210	5	13
212	11	13
213	10	13
213	10	13
214	7	13
215	0	14
216	4	14
217	7	14
218	4	13
219	4	13
220	5	14
221	8	14
222	8	14
223	11	14
224	14	14
225	14	14
226	14	14
227	13	14
228	13	14
229	13	14
230	14	14
231	13	14
232	9	13
233	8	13
234	12	14

O	W	C
235	11	14
236	13	14
237	14	14
238	5	11
239	14	14
240	14	14
241	14	14
242	14	14
243	10	14
244	5	14
245	3	14
246	9	14
247	7	14
248	5	14
249	9	14
250	7	14
251	13	14
252	14	14
253	14	14
254	9	14
255	10	14
256	10	14
257	10	14
258	10	14
259	10	14
260	10	14
261	9	14
262	10	14
263	10	14
264	12	14
265	13	14
266	12	14
267	10	14
268	10	14
269	9	14
270	9	14
271	7	14

APPENDIX 20

Mech. (5)

19 Machine Shop Engineering ONC, O2 Production Year Students

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C
1	1	10
2	0	11
3	1	11
4	1	10
5	2	10
6	1	11
7	1	11
8	10	12
9	2	12
10	1	12
11	1	10
12	0	10
13	0	13
14	1	14
15	2	15
16	2	13
17	7	13
18	2	13
19	1	14
20	5	15
21	0	12
22	1	15
23	5	14
24	1	8
25	5	7
26	5	13
27	10	16
28	12	16
29	12	16
30	15	15
31	14	14
32	17	16
33	16	16
34	2	15
35	1	14
36	3	14
37	1	14
38	1	11
39	1	11
40	3	10
41	3	13
42	2	12
43	2	14
44	2	14
45	1	14
46	2	15
47	1	10
48	1	13
49	1	14
50	3	13
51	1	13
52	1	13
53	4	13
54	2	15
55	1	14
56	0	14
57	1	12
58	1	14
59	1	14
60	1	14
61	1	13
62	2	12
63	0	14
64	0	14
65	4	14
66	1	13
67	0	13
68	0	14
69	0	14
70	4	15
71	6	15
72	1	14
73	1	15
74	6	15
75	0	15
76	1	17
77	1	16
78	1	12
79	7	10
80	10	9
81	11	9
82	12	9
83	12	9
84	11	9
85	9	16
86	3	6
87	2	9
88	2	10
89	2	7
90	6	10
91	4	13
92	1	9
93	2	7
94	7	12
95	16	19
96	17	19
97	16	19
98	16	18
99	10	18
100	5	11
101	3	14
102	10	15
103	7	14
104	5	14
105	2	14
106	1	13
107	2	13
108	1	11
109	6	11
110	0	12
111	1	13
112	0	13
113	2	13
114	1	13
115	1	13
116	3	12
117	2	15
118	7	17
119	6	17
120	1	15
121	1	16
122	1	17
123	5	15
124	3	15
125	1	14
126	1	16
127	1	17
128	1	16
129	1	16
130	1	16
131	1	15
132	2	14

APPENDIX 20

Mech. (5) contd.

O	W	C	O	W	C	O	W	C	O	W	C
133	2	15	167	1	12	2o1	7	16	235	10	17
134	2	15	168	1	12	202	14	18	236	8	17
135	2	15	169	1	12	203	13	18	237	12	17
136	4	17	170	2	15	204	15	16	238	5	14
137	5	17	171	2	15	205	15	17	239	7	16
138	9	18	172	2	15	206	16	17	240	9	16
139	5	18	173	2	15	207	16	18	241	8	16
140	7	17	174	2	17	208	17	18	242	12	17
141	6	16	175	3	18	209	16	18	243	8	16
142	1	15	176	5	16	210	6	17	244	3	15
143	2	17	177	4	17	211	7	17	245	4	16
144	2	17	178	2	17	212	12	18	246	4	16
145	2	17	179	1	17	213	10	18	247	4	16
146	3	17	180	7	13	214	11	17	248	8	16
147	8	15	181	8	16	215	4	16	249	8	16
148	8	14	182	12	14	216	3	16	250	7	16
149	9	14	183	6	14	217	6	17	251	16	17
150	9	14	184	4	14	218	4	17	252	15	17
151	8	14	185	8	15	219	3	15	253	12	17
152	5	13	186	4	17	220	4	17	254	7	16
153	3	19	187	3	12	221	5	17	255	6	15
154	3	19	188	5	17	222	4	16	256	4	17
155	3	19	189	8	17	223	3	16	257	4	16
156	8	19	190	6	17	224	12	17	258	7	16
157	12	19	191	6	17	225	17	17	259	5	16
158	11	19	192	3	15	226	15	17	260	7	17
159	10	19	193	8	18	227	12	17	261	4	16
160	9	19	194	8	17	228	4	16	262	4	14
161	16	19	195	8	17	229	5	17	263	5	14
162	13	19	196	15	15	230	10	17	264	4	16
163	5	18	197	15	17	231	11	17	265	4	16
164	8	17	198	18	17	232	3	15	266	3	16
165	2	14	199	18	17	233	6	15	267	3	16
166	1	13	200	16	17	234	8	15	268	4	7
									269	8	17
									270	4	16
									271	6	16

APPENDIX 20

Mech (6)

15 Mechanical Engineering Craft students having completed 2nd Year of three years full-time experimental course

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	0	0	43	0	6	85	0	9	127	1	6
2	0	2	44	0	1	86	1	2	128	0	5
3	0	2	45	0	5	87	6	5	129	1	3
4	0	4	46	1	6	88	3	3	130	1	6
5	2	5	47	1	3	89	1	1	131	1	5
6	3	9	48	0	4	90	4	2	132	2	5
7	1	5	49	1	5	91	6	5	133	3	7
8	6	3	50	0	7	92	1	7	134	0	5
9	1	6	51	0	6	93	1	4	135	1	3
10	0	7	52	0	2	94	1	1	136	0	5
11	1	5	53	0	4	95	5	9	137	1	5
12	0	7	54	0	5	96	0	8	138	4	8
13	1	8	55	0	7	97	9	10	139	7	8
14	0	11	56	1	7	98	12	12	140	0	4
15	0	9	57	0	4	99	6	6	141	1	2
16	0	6	58	2	5	100	1	4	142	2	7
17	1	4	59	0	4	101	0	4	143	3	7
18	0	3	60	0	5	102	1	8	144	3	8
19	1	7	61	0	8	103	0	5	145	4	8
20	5	9	62	2	2	104	1	2	146	1	4
21	1	6	63	3	7	105	0	7	147	3	7
22	2	9	64	2	6	106	0	7	148	3	5
23	2	10	65	4	11	107	2	4	149	1	8
24	0	6	66	4	6	108	0	2	150	4	5
25	2	3	67	0	3	109	7	4	151	4	8
26	7	7	68	0	6	110	0	6	152	3	3
27	1	9	69	0	8	111	0	8	153	2	2
28	4	10	70	8	10	112	0	6	154	2	5
29	1	10	71	5	12	113	7	11	155	5	7
30	4	9	72	0	6	114	3	7	156	2	5
31	1	3	73	0	6	115	0	7	157	7	10
32	3	6	74	9	7	116	0	3	158	7	5
33	1	5	75	3	5	117	4	6	159	7	7
34	0	4	76	9	2	118	8	9	160	8	6
35	1	2	77	0	5	119	8	10	161	9	10
36	3	5	78	0	5	120	0	5	162	9	11
37	1	4	79	5	2	121	1	4	163	5	12
38	0	5	80	3	2	122	0	6	164	10	12
39	0	5	81	7	7	123	2	7	165	4	9
40	2	5	82	8	8	124	1	8	166	3	6
41	2	7	83	3	4	125	0	3	167	4	7
42	0	4	84	6	7	126	0	7	168	4	7

APPENDIX 20

Mech (6) (continued)

O	W	C	O	W	C	O	W	C
169	6	8	217	6	6	265	5	5
170	5	10	218	2	7	266	3	5
171	6	11	219	1	4	267	5	8
172	7	7	220	1	4	268	7	7
173	6	7	221	1	5	269	3	6
174	0	4	222	0	4	270	3	2
175	1	5	223	1	5	271	3	5
176	6	10	224	8	12			
177	3	7	225	8	11			
178	3	8	226	7	12			
179	1	7	227	5	11			
180	4	7	228	2	7			
181	3	7	229	4	11			
182	8	8	230	5	9			
183	0	5	231	7	10			
184	0	5	232	3	7			
185	2	7	233	5	9			
186	7	10	234	9	9			
187	1	3	235	4	5			
188	1	6	236	1	10			
189	6	8	237	6	5			
190	0	5	238	1	8			
191	0	6	239	7	7			
192	2	2	240	6	9			
193	2	5	241	6	8			
194	4	6	242	6	9			
195	3	10	243	4	7			
196	11	5	244	2	8			
197	7	4	245	2	4			
198	7	9	246	3	6			
199	7	10	247	3	7			
200	8	8	248	3	9			
201	0	6	249	4	8			
202	6	10	250	3	6			
203	6	10	251	5	8			
204	4	6	252	4	7			
205	4	8	253	6	8			
206	2	4	254	4	7			
207	2	4	255	2	6			
208	5	4	256	2	7			
209	2	6	257	1	6			
210	4	9	258	4	6			
211	5	10	259	3	10			
212	4	7	260	4	7			
213	8	11	261	2	6			
214	10	10	262	2	7			
215	2	6	263	2	4			
216	3	7	264	1	4			

APPENDIX 20

Mech (7)

12 Production Engineering students, all tradesmen, having completed the Higher National Certificate Course in Production Engineering.

O = Operation No.
W = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C	O	W	C	O	W	C	O	W	C
1	0	3	41	0	9	81	10	3	121	2	5
2	0	4	42	1	4	82	10	3	122	3	7
3	0	5	43	4	8	83	6	3	123	3	10
4	0	6	43	4	7	84	5	3	124	4	9
5	0	7	45	0	9	85	2	10	125	3	7
6	0	11	46	2	8	86	2	3	126	3	10
7	1	10	47	0	5	87	2	5	127	3	10
8	3	12	48	1	6	88	0	6	128	4	9
9	0	12	49	1	9	89	1	4	129	3	4
10	0	9	50	2	10	90	7	6	130	2	6
11	0	6	51	1	10	91	1	7	131	3	8
12	0	7	52	2	7	92	1	7	132	3	8
13	0	5	53	4	9	93	1	5	133	3	7
14	0	9	54	4	8	94	3	8	134	5	8
15	1	9	55	2	10	95	13	11	135	5	6
16	0	7	56	2	11	96	12	13	136	0	11
17	3	11	57	1	5	97	10	13	137	1	12
18	1	5	58	1	6	98	13	13	138	3	12
19	0	7	59	2	9	99	3	10	139	0	12
20	3	11	60	1	9	100	4	7	140	5	9
21	0	7	61	1	6	101	3	8	141	5	10
22	0	11	62	0	6	102	5	12	142	0	8
23	0	13	63	0	6	103	4	11	143	0	9
24	1	4	64	0	7	104	3	7	144	0	8
25	3	3	65	4	11	105	3	11	145	1	9
26	5	5	66	5	12	106	3	9	146	0	7
27	5	10	67	1	7	107	4	10	147	4	7
28	3	12	68	0	8	108	2	7	148	3	8
29	4	9	69	0	6	109	5	7	149	5	5
30	10	11	70	3	9	110	1	10	150	6	5
31	9	11	71	2	11	111	1	10	151	4	5
32	10	9	72	1	9	112	1	10	152	4	6
33	10	9	73	1	10	113	2	10	153	4	9
34	0	6	74	5	11	114	1	10	154	3	9
35	2	3	75	6	10	115	1	10	155	3	10
36	2	8	76	3	10	116	3	6	156	2	11
37	0	5	77	0	7	117	3	9	157	6	11
38	0	4	78	0	6	118	4	9	158	6	12
39	0	6	79	5	3	119	2	10	159	3	12
40	0	5	80	7	3	120	2	5	160	3	11

APPENDIX 20

Mech (7) (continued)

O	W	C
161	7	12
162	6	11
163	0	10
164	2	11
165	3	1
166	3	5
167	2	6
168	1	6
169	1	7
170	1	9
171	3	9
172	2	8
173	1	9
174	2	10
175	2	8
176	3	10
177	5	10
178	1	9
179	1	7
180	4	6
181	4	6
182	5	6
183	4	10
184	2	9
185	3	11
186	4	11
187	1	6
188	1	9
189	2	11
190	1	11
191	1	11
192	1	11
193	5	11
194	4	10
195	7	10
196	5	8
197	5	8
198	7	10
199	8	10
200	6	10
201	5	11
202	9	12
203	8	11
204	4	8
205	6	11
206	5	10
207	5	11
208	6	11
209	5	10
210	3	10
211	3	9
212	4	11
213	6	12
214	3	12
215	3	8
216	3	9
217	3	10
218	6	10
219	3	8
220	3	10
221	3	10
222	6	9
223	2	10
224	9	12
225	9	12
226	8	12
227	4	12
228	1	11
229	3	12
230	7	12
231	4	12
232	4	10
333	4	10
234	4	10
235	4	8
236	7	12
237	8	12
238	3	11
239	5	12
240	6	12
241	8	12
242	7	12
243	5	11
244	3	11
245	2	9
246	4	10
247	4	10
248	4	9
249	5	10
250	5	10
251	9	11
252	8	10
253	10	10
254	6	9
255	2	10
256	3	9
257	3	11
258	4	11
259	6	11
260	5	11
261	5	11
262	1	11
263	3	10
264	4	11
265	5	11
266	3	11
267	4	12
268	3	11
269	5	11
270	1	10
271	2	11

APPENDIX 20

Mech. (8)

34 Royal Naval Artificer Apprentices having completed a three years' Naval Apprenticeship.

O = Operation
X = No. of students not having done operation at work
C = No. of students not having done operation at classes

O	W	C
1	2	2
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	1
8	2	2
9	1	2
10	1	1
11	0	0
12	0	0
13	0	0
14	0	2
15	0	3
16	0	1
17	2	2
18	0	1
19	0	1
20	0	2
21	0	2
22	0	4
23	0	10
24	0	2
25	3	0
26	1	1
27	0	8
28	6	6
29	0	5
30	3	7
31	1	5
32	10	14
33	7	18
34	0	0
35	0	0
36	1	6
37	0	1
38	0	1
39	0	1
40	0	1
41	0	1
42	0	1
43	0	0
44	0	0
45	1	2
46	0	0
47	0	0
48	0	1
49	0	0
50	1	1
51	0	1
52	0	0
53	0	0
54	0	1
55	3	5
56	1	2
57	0	0
58	0	0
59	0	0
60	0	0
61	0	0
62	2	0
63	0	0
64	0	0
65	5	10
66	4	3
67	0	0
68	0	0
69	0	0
70	5	1
71	1	2
72	0	0
73	3	3
74	10	9
75	0	1
76	2	3
77	0	0
78	0	0
79	4	0
80	2	0
81	3	0
82	10	0
83	2	0
84	2	0
85	1	2
86	1	0
87	0	0
88	0	0
89	0	0
90	2	1
91	0	2
92	0	1
93	0	1
94	6	4
95	21	18
96	8	14
97	17	17
98	1	5
99	1	1
100	1	1
101	1	3
102	7	11
103	5	8
104	1	1
105	1	2
106	0	1
107	0	0
108	0	0
109	9	0
110	1	2
111	0	0
112	0	0
113	0	1
114	0	0
115	0	0
116	0	0
117	9	0
118	9	2
119	12	2
120	0	0
121	1	1
122	0	2
123	5	6
124	1	2
125	0	0
126	1	1
127	2	1
128	3	2
129	0	1
130	2	1
131	1	1
132	0	0
133	1	1
134	0	0
135	0	0
136	0	0
137	0	0
138	1	1
139	3	3
140	26	23
141	25	20
142	0	0
143	0	3
144	0	1
145	1	1
146	2	1
147	4	0
148	2	0
149	7	0
150	18	2
151	12	7
151	12	7
152	10	6
153	3	4
154	3	4
155	3	3
156	2	2
157	7	2
158	6	2
159	5	1
160	5	5
161	9	11
162	5	9
163	13	17
164	22	24
165	3	2
166	0	11
167	0	1
168	0	1
169	0	1
170	7	2
171	12	6
172	10	4
173	10	7
174	0	1
175	3	5

APPENDIX 20

Mech. (8) contd.

O	W	C
176	4	1
177	10	1
178	0	1
179	11	2
180	13	9
181	3	5
182	28	27
183	2	0
184	1	0
185	27	2
186	1	1
187	0	0
188	0	0
189	1	1
190	0	0
191	0	0
192	0	0
193	6	5
194	1	0
195	2	3
196	30	26
197	27	26
198	29	28
199	29	29
200	26	26
201	3	3
202	18	15
203	17	16
204	22	22
205	25	22
206	21	20
207	21	21
208	23	22
209	21	21
210	3	3
211	7	4
212	1	2
213	15	6
214	10	6
215	3	1
216	5	3
217	0	2
218	16	7
219	0	0
220	1	1
221	1	1
222	2	1
223	2	3
224	29	15
225	31	16
226	31	17
227	28	16
228	12	20
229	13	15
230	26	27
231	1	1
232	1	1
233	8	1
234	14	2
235	2	0
236	2	0
237	2	0
238	4	2
239	1	1
240	7	5
241	2	2
242	1	2
243	15	11
245	4	2
245	4	2
246	6	5
247	3	3
248	3	3
249	6	6
250	6	7
251	17	13
252	14	9
253	1	1
254	8	4
255	21	8
256	22	7
257	20	6
258	19	9
259	19	16
260	18	11
261	16	7
262	22	9
263	19	8
264	22	11
265	23	9
266	24	12
267	23	19
268	17	2
269	23	10
270	22	10
271	8	6

APPENDIX 21

Check List of Operations.

O = No. of students having done operation occasionally

A = No. of students having done operation an average amount

L = No. of students having done operation a lot

N = No. of students never having done operation

Sub-Appendix No.	Group
1	15 Full-time Experimental Course Students
2	34 Royal Naval Artificer Apprentices

APPENDIX 21

(1)

15 Mechanical Engineering Craft students, having completed 2nd Year of a three years full-time experimental course.

O = No. of students having done operation occasionally
A = No. of students having done operation an average amount
L = No. of students having done operation a lot
N = No. of students never having done operation

Operation No.	AT WORK				AT CLASSES			
	O	A	L	N	O	A	L	N
1	0	4	11	0	0	2	13	0
2	2	1	12	0	1	6	6	2
3	0	1	14	0	0	3	10	2
4	3	5	7	0	2	2	7	4
5	1	4	8	2	2	3	5	5
6	4	2	6	3	2	3	1	9
7	5	5	4	1	2	0	8	5
8	4	3	2	6	2	7	3	3
9	2	7	5	1	5	1	3	6
10	1	2	12	0	1	5	2	7
11	3	3	8	1	5	3	2	5
12	0	3	12	0	2	5	1	7
13	2	2	10	1	3	3	1	8
14	1	5	9	0	3	1	0	11
15	3	3	9	0	1	3	2	9
16	3	4	8	0	2	4	3	6
17	7	4	3	1	6	3	2	4
18	1	4	10	0	1	2	9	3
19	0	2	12	1	0	2	6	7
20	6	2	2	5	1	1	4	9
21	3	7	4	1	4	1	4	6
22	7	4	2	2	3	1	2	9
23	5	5	3	2	2	1	2	10
24	1	1	13	0	1	3	5	6
25	10	1	2	2	3	4	5	3
26	2	4	2	7	5	2	1	7
27	1	5	8	1	4	1	1	9
28	3	6	2	4	0	4	1	10
29	2	5	7	1	3	1	1	10
30	7	3	1	4	2	3	1	9
31	2	7	5	1	4	3	5	3
32	4	6	2	3	3	3	3	6
33	5	5	4	1	7	2	1	5
34	0	3	12	0	3	3	5	4
35	1	5	8	1	2	4	7	2
36	1	3	8	3	6	0	4	5
37	0	3	11	1	3	6	2	4
38	0	2	13	0	2	1	7	5

APPENDIX 21

(1) (continued)

Operation No.	AT WORK O	A	L	N	AT CLASSES O	A	L	N
39	4	4	7	0	2	6	2	5
40	1	7	5	2	1	5	4	5
41	2	3	8	2	4	2	2	7
42	1	4	10	0	0	2	9	4
43	4	4	7	0	1	3	5	6
44	1	2	12	0	2	0	12	1
45	0	2	13	0	3	2	5	5
46	1	1	12	1	2	5	2	6
47	1	4	9	1	2	5	5	3
48	0	2	13	0	4	4	3	4
49	1	1	12	1	1	3	6	5
50	7	2	6	0	5	1	2	7
51	3	6	6	0	2	6	1	6
52	0	6	9	0	2	5	6	2
53	3	2	10	0	3	3	5	4
54	1	9	5	0	1	8	1	5
55	2	2	11	0	3	2	3	7
56	4	4	6	1	3	4	1	7
57	1	5	9	0	3	1	7	4
58	0	3	10	2	6	1	3	5
59	1	5	9	0	4	5	2	4
60	1	6	8	0	3	4	3	5
61	6	0	9	0	3	2	2	8
62	6	1	6	2	6	3	4	2
63	1	5	6	3	3	3	2	7
64	8	3	2	2	6	1	2	6
65	7	3	1	4	2	2	0	11
66	6	5	0	4	4	0	5	6
67	1	4	10	0	1	2	9	3
68	1	1	13	0	2	3	4	6
69	2	2	11	0	2	1	4	8
70	2	3	2	8	4	1	0	10
71	5	3	2	5	1	1	1	12
72	4	7	4	0	4	2	3	6
73	4	6	5	0	4	3	2	6
74	2	3	1	9	4	3	1	7
75	3	7	2	3	4	3	3	5
76	0	4	2	9	7	4	2	2
77	2	4	9	0	3	1	6	5
78	2	8	5	0	2	5	3	5
79	6	2	2	5	9	4	0	2
80	6	6	0	3	8	4	1	2
81	3	4	1	7	4	3	1	7
82	3	3	1	8	4	3	0	8
83	10	2	0	3	8	2	1	4
84	5	2	2	6	5	3	0	7
85	8	4	3	0	2	2	2	9
86	1	4	9	1	1	5	7	2
87	2	5	2	6	4	3	3	5
88	8	1	3	3	6	3	3	3

APPENDIX 21

(i) (continued)

Operation No.	AT WORK O	AT WORK A	AT WORK L	AT WORK N	AT CLASSES O	AT CLASSES A	AT CLASSES L	AT CLASSES N
89	2	1	11	1	2	9	3	1
90	4	5	2	4	4	7	2	2
91	3	4	2	6	7	2	1	5
92	2	7	5	1	1	5	2	7
93	1	5	8	1	2	4	5	4
94	7	6	1	1	2	10	2	1
95	2	6	2	5	3	1	2	9
96	6	6	3	0	3	3	1	8
97	4	2	0	9	4	1	0	10
98	1	1	1	12	2	0	1	12
99	5	2	2	6	4	3	2	6
100	0	5	9	1	1	7	3	4
101	1	3	11	0	4	2	5	4
102	8	6	0	1	2	5	0	8
103	3	12	0	0	5	5	0	5
104	0	5	9	1	1	4	8	2
105	1	4	10	0	2	3	3	7
106	4	4	7	0	1	6	1	7
107	2	7	4	2	5	6	0	4
108	2	4	9	0	4	3	6	2
109	4	3	1	7	6	3	2	4
110	0	4	11	0	1	4	4	6
111	1	7	7	0	1	4	2	8
112	6	6	3	0	5	2	2	6
113	2	2	4	7	1	1	2	11
114	0	3	9	3	2	3	3	7
115	1	5	9	0	2	4	2	7
116	4	8	3	0	4	6	2	3
117	4	7	0	4	4	5	0	6
118	4	2	1	8	3	3	0	9
119	5	2	0	8	3	1	1	10
120	2	3	10	0	2	3	5	5
121	1	4	9	1	4	4	3	4
122	0	2	13	0	2	2	5	6
123	5	5	3	2	2	5	1	7
124	5	8	1	1	3	4	0	8
125	3	3	9	0	0	6	6	3
126	2	4	9	0	4	1	3	7
127	0	3	11	1	3	4	2	6
128	3	7	5	0	5	2	3	5
129	1	4	9	1	1	5	6	3
130	3	3	8	1	2	3	4	6
131	2	4	8	1	2	7	1	5
132	1	6	6	2	3	5	2	5
133	1	4	7	3	3	3	2	7
134	7	4	4	0	4	3	3	5
135	3	2	9	1	3	4	5	3
136	8	5	2	0	3	5	2	5
137	8	6	0	1	2	4	4	5
138	7	2	2	4	2	4	1	8
139	5	3	0	7	4	3	0	8
140	5	6	4	0	7	1	3	4

APPENDIX 21

(1) (continued)

Operation No.	AT WORK				AT CLASSES			
	O	A	L	N	O	A	L	N
141	6	3	5	1	6	2	5	2
142	2	6	5	2	2	2	4	7
143	4	7	1	3	5	3	0	7
144	4	6	2	3	3	4	0	8
145	4	6	1	4	5	2	0	8
146	2	10	2	1	3	8	0	4
147	4	6	2	3	2	4	2	7
148	3	6	3	3	3	5	2	5
149	3	7	4	1	2	2	3	8
150	2	6	3	4	3	4	3	5
151	5	5	1	4	1	6	0	8
152	3	3	6	3	5	2	5	3
153	5	4	4	2	3	9	1	2
154	5	5	3	2	2	7	1	5
155	4	4	2	5	4	4	0	7
156	5	4	4	2	8	1	1	5
157	0	4	4	7	1	3	1	10
158	4	3	1	7	5	3	2	5
159	5	1	2	7	3	1	4	7
160	3	2	2	8	6	2	1	6
161	3	1	2	9	2	1	2	10
162	2	2	2	9	4	0	0	11
163	7	2	1	5	1	2	0	12
164	1	2	2	10	3	0	0	12
165	5	2	4	4	2	2	2	9
166	4	3	5	3	4	3	2	6
167	4	4	3	4	4	3	1	7
168	3	5	3	4	4	2	2	7
169	2	4	3	6	2	3	2	8
170	6	3	1	5	3	1	1	10
171	2	5	2	6	2	1	1	11
172	4	3	1	7	6	2	0	7
173	4	3	2	6	6	2	0	7
174	6	4	5	0	4	1	6	4
175	0	0	14	1	2	2	6	5
176	2	4	3	6	2	2	1	10
177	2	8	2	3	2	3	3	7
178	4	7	1	3	1	5	1	8
179	5	6	3	1	5	0	3	7
180	4	4	3	4	4	1	3	7
181	2	6	4	3	3	3	2	7
182	2	2	3	8	2	3	2	8
183	1	5	9	0	3	1	6	5
184	2	3	10	0	1	2	7	5
185	6	3	4	2	1	3	4	7
186	4	2	2	7	2	2	1	10
187	2	5	7	1	4	2	6	3
188	5	1	8	1	1	3	5	6
189	2	5	2	6	2	3	2	8
190	3	3	9	0	2	4	4	5
191	6	3	6	0	3	4	2	6
192	2	4	7	2	3	4	6	2

APPENDIX 21

(1) (continued)

Operation No.	AT WORK				AT CLASSES			
	O	A	L	N	O	A	L	N
193	2	8	3	2	3	5	2	5
194	6	5	0	4	3	2	4	6
195	3	3	6	3	0	4	1	10
196	3	0	1	11	5	4	1	5
197	2	4	2	7	2	7	2	4
198	3	3	2	7	2	3	1	9
199	3	3	2	7	2	3	0	10
200	3	1	3	8	1	3	3	8
201	2	11	2	0	4	3	2	6
202	5	2	2	6	1	3	1	10
203	2	5	2	6	6	1	3	5
204	4	4	3	4	2	3	4	6
205	2	7	2	4	1	2	4	8
206	4	5	4	2	2	3	6	4
207	4	7	2	2	4	4	3	4
208	3	5	2	5	3	4	4	4
209	5	4	4	2	2	3	4	6
210	3	5	3	4	3	1	2	9
211	3	5	2	5	1	3	1	10
212	2	5	4	4	2	3	3	7
213	1	3	3	8	3	0	1	11
214	1	1	3	10	2	1	2	10
215	3	6	4	2	2	3	4	6
216	4	5	3	3	1	5	2	7
217	5	2	2	6	3	4	2	6
218	4	4	5	2	1	4	3	7
219	3	5	6	1	2	5	4	4
220	1	8	5	1	3	3	5	4
221	1	6	7	1	5	0	5	5
222	3	7	5	0	6	3	2	4
223	4	2	8	1	3	5	2	5
224	3	3	1	8	1	2	0	12
225	2	4	1	8	3	1	0	11
226	2	4	2	7	2	0	1	12
227	4	2	4	5	2	1	1	11
228	7	4	2	2	4	2	2	7
229	4	5	2	4	2	2	0	11
230	5	5	0	5	2	4	0	9
231	6	2	0	7	2	1	2	10
232	3	7	2	3	2	5	1	7
233	3	4	3	5	3	3	0	9
234	3	2	1	9	3	1	2	9
235	6	1	4	4	4	4	2	5
236	7	5	2	1	2	2	1	10
237	3	3	3	6	2	6	2	5
238	4	7	3	1	2	2	3	8
239	6	1	1	7	6	2	0	7
240	3	4	2	6	2	4	0	9
241	3	5	1	6	1	4	2	8
242	3	5	1	6	3	3	0	9

APPENDIX 21

(i) (continued).

Operation No.	AT WORK				AT CLASSES			
	O	A	L	N	O	A	L	N
243	5	4	2	4	1	6	1	7
244	6	4	3	2	1	3	3	8
245	1	8	4	2	2	3	6	4
246	4	5	3	3	2	4	3	6
247	6	2	4	3	2	3	3	7
248	4	4	4	3	1	3	2	9
249	3	7	1	4	0	5	2	8
250	3	6	3	3	5	2	2	6
251	5	5	0	5	3	3	1	8
252	6	4	1	4	4	4	0	7
253	3	6	0	6	0	6	1	8
254	3	6	2	4	1	4	3	7
255	5	4	4	2	2	6	1	6
256	2	6	5	2	3	2	3	7
257	3	8	3	1	2	3	4	6
258	7	2	2	4	2	5	2	6
259	6	4	2	3	2	2	1	10
260	7	2	2	4	2	3	3	7
261	3	8	2	2	3	3	3	6
262	4	5	4	2	4	3	1	7
263	4	5	4	2	4	4	3	4
264	4	6	4	1	3	5	3	4
265	4	2	4	5	3	6	1	5
266	5	1	6	3	5	4	1	5
267	6	2	2	5	4	2	1	8
268	3	2	3	7	4	2	2	7
269	1	8	3	3	1	6	2	6
270	4	7	1	3	5	6	2	2
271	1	4	7	3	4	4	2	5

APPENDIX 21

(2)

34 Royal Naval Artificer Apprentices having completed a three years' Naval Apprenticeship.

O = No. of students having done operation occasionally
A = No. of students having done operation an average amount
L = No. of students having done operation a lot
N = No. of students never having done operation

Operation	Have Done - At Work				Have Done - At Classes			
No.	O	A	L	N	O	A	L	N
1	1	3	28	2	2	6	24	2
2	1	2	31	0	3	6	25	0
3	2	2	30	0	2	8	23	1
4	1	4	29	0	5	7	22	0
5	3	2	29	0	5	10	19	0
6	3	2	29	0	10	5	19	0
7	1	8	25	0	5	11	17	1
8	13	10	9	2	13	13	6	2
9	6	13	14	1	11	14	7	2
10	0	2	31	1	11	9	13	1
11	1	4	29	0	4	7	23	0
12	1	3	30	0	3	9	22	0
13	2	1	31	0	4	8	22	0
14	1	6	27	0	13	10	9	2
15	1	6	27	0	2	15	14	3
16	2	2	30	0	5	8	20	1
17	5	14	13	2	8	9	15	2
18	0	4	30	0	3	6	24	1
19	0	3	31	0	5	9	19	1
20	8	14	12	0	11	14	7	2
21	2	10	22	0	8	10	14	2
22	4	12	18	0	5	12	13	4
23	3	7	24	0	8	6	10	10
24	1	1	32	0	3	9	20	2
25	15	8	8	3	1	13	20	0
26	14	14	5	1	6	19	8	1
27	8	20	6	0	8	16	2	8
28	14	11	3	6	19	7	2	6
29	15	16	3	0	15	13	1	5
30	18	11	2	3	17	7	3	7
31	17	13	3	1	17	10	2	5
32	16	7	1	10	8	8	4	14
33	17	8	2	7	9	2	5	18
34	0	1	33	0	4	10	20	0
35	2	4	28	0	3	11	20	0
36	3	13	17	1	7	14	7	6
37	2	6	26	0	3	15	15	1
38	2	4	28	0	3	16	14	1
39	3	10	21	0	6	14	13	1
40	4	12	18	0	4	15	14	1

APPENDIX 21

(2) continued

Operation No.	Have Done - At Work				Have Done - At Classes			
	O	A	L	N	O	A	L	N
41	3	8	23	0	2	20	11	1
42	2	8	24	0	4	11	18	1
43	2	4	28	0	3	21	10	0
44	1	11	22	0	4	14	16	0
45	0	2	31	1	2	10	20	2
46	0	4	30	0	7	15	12	0
47	1	2	31	0	3	16	15	0
48	1	1	32	0	6	11	16	1
49	1	1	32	0	6	13	15	0
50	4	8	21	1	15	12	6	1
51	4	11	19	0	11	13	9	1
52	0	6	28	0	2	10	22	0
53	3	9	22	0	9	14	11	0
54	1	6	27	0	6	15	12	1
55	2	3	26	3	9	9	11	5
56	3	1	29	1	11	10	11	2
57	0	3	31	0	0	15	19	0
58	1	1	32	0	3	14	17	0
59	3	4	27	0	7	13	14	0
60	3	1	30	0	5	14	15	0
61	2	5	27	0	3	15	16	0
62	4	7	21	2	4	12	18	0
63	1	14	19	0	9	16	9	0
64	2	11	21	0	7	19	8	0
65	11	11	7	5	11	9	4	10
66	7	15	8	4	15	12	4	3
67	0	9	25	0	5	13	16	0
68	1	4	29	0	5	16	13	0
69	0	3	31	0	6	13	15	0
70	9	11	9	5	19	7	7	1
71	11	15	7	1	19	9	4	2
72	5	16	13	0	20	11	3	0
73	9	10	12	3	18	8	5	3
74	14	4	6	10	15	7	3	9
75	6	14	14	0	11	12	10	1
76	19	8	5	2	21	7	3	3
77	1	6	27	0	6	13	15	0
78	10	15	9	0	17	13	4	0
79	7	18	5	4	4	12	18	0
80	11	12	9	2	3	14	17	0
81	13	13	5	3	8	12	14	0
82	8	11	5	10	6	14	14	0
83	9	16	7	2	6	14	14	0
84	7	19	6	2	6	14	14	0
85	7	5	21	1	13	12	7	2
86	7	12	14	1	2	11	21	0
87	6	13	15	0	6	15	13	0
88	3	12	19	0	6	15	13	0
89	1	2	31	0	6	13	15	0
90	15	13	4	2	11	13	9	1
91	12	4	18	0	13	13	6	2
92	2	9	23	0	10	14	9	1

APPENDIX 21

(2) continued

Operation No.	Have Done - At Work				Have Done - At Classes			
	O	A	L	N	O	A	L	N
93	0	5	29	0	11	12	10	1
94	15	9	4	6	15	11	4	4
95	8	5	0	21	14	2	0	18
96	18	6	2	8	16	3	1	14
97	8	7	2	17	6	9	2	17
98	14	13	6	1	15	10	4	5
99	9	22	2	1	8	17	8	1
100	2	16	15	1	7	15	10	2
101	2	18	13	1	9	16	6	3
102	13	12	2	7	15	7	1	11
103	14	11	4	5	14	12	0	8
104	3	10	20	1	6	9	18	1
105	7	14	12	1	13	13	6	2
106	3	6	25	0	11	12	10	1
107	8	8	18	0	12	14	8	0
108	2	5	27	0	6	20	8	0
109	16	4	5	9	17	10	7	0
110	4	4	24	2	10	15	7	2
111	2	4	28	0	8	19	7	0
112	6	8	20	0	11	18	5	0
113	4	11	19	0	17	13	3	1
114	1	3	30	0	12	17	5	0
115	2	1	31	0	9	18	7	0
116	5	11	18	0	7	16	11	0
117	12	6	7	9	15	17	2	0
118	13	5	7	9	15	16	1	2
119	11	4	7	12	16	14	2	2
120	6	20	8	0	6	22	6	0
121	6	17	10	1	6	21	6	1
122	4	16	14	0	10	19	2	3
123	12	12	5	5	16	9	2	7
124	13	15	5	1	17	11	3	3
125	2	12	20	0	3	15	16	0
126	5	18	10	1	11	17	4	2
127	5	15	12	2	10	20	3	1
128	11	13	7	3	14	16	2	2
129	15	7	12	0	16	12	5	1
130	11	10	12	1	17	11	5	1
131	8	16	9	1	10	19	4	1
132	8	17	9	0	11	19	4	0
133	6	19	8	1	12	17	4	1
134	14	14	6	0	17	14	3	0
135	4	10	20	0	7	11	16	0
136	1	11	22	0	4	18	12	0
137	6	16	12	0	12	15	7	0
138	12	16	5	1	16	11	6	1
139	9	14	8	3	19	12	2	1
140	5	1	2	26	9	2	0	23
141	5	1	3	25	9	2	1	22
142	5	11	18	0	12	13	9	0
143	15	16	3	0	19	9	3	3
144	13	17	4	0	20	12	1	1

(2) continued

Operation No.	Have Done - At Work				Have Done - At Classes			
	O	A	L	N	O	A	L	N
145	11	19	3	1	22	11	0	1
146	7	19	6	2	16	16	1	1
147	17	12	1	4	6	18	10	0
148	19	10	3	2	5	18	11	0
149	17	9	1	7	7	20	7	0
150	7	7	2	18	6	14	12	2
151	11	9	2	12	9	10	8	7
152	10	7	7	10	10	6	12	6
153	10	16	5	3	13	15	2	4
154	11	14	6	3	13	16	1	4
155	10	20	1	3	17	13	1	3
156	6	10	16	2	12	15	5	2
157	12	13	2	7	18	12	2	2
158	14	11	3	6	17	13	2	2
159	16	10	3	5	20	11	2	1
160	17	7	5	5	15	7	7	5
161	21	4	0	9	21	2	0	11
162	24	5	0	5	22	3	0	9
163	16	4	1	13	13	4	0	17
164	8	3	1	22	6	4	0	24
165	13	9	10	2	7	12	13	2
166	6	13	15	0	5	17	11	1
167	7	11	16	0	10	16	7	1
168	4	13	17	0	5	20	8	1
169	8	7	19	0	10	16	7	1
170	19	5	3	7	24	6	2	2
171	14	5	3	12	18	8	2	6
172	15	5	4	10	20	8	2	4
173	8	5	2	19	15	10	2	7
174	2	10	22	0	6	17	10	1
175	4	10	17	3	13	9	7	5
176	12	10	8	4	9	18	6	1
177	8	10	6	10	10	16	7	1
178	5	17	12	0	10	14	9	1
179	6	17	10	1	10	14	8	2
180	10	0	11	13	17	1	7	9
181	16	7	8	3	15	9	5	5
182	2	3	1	28	6	1	0	27
183	10	12	10	2	11	17	6	0
184	3	14	16	1	8	20	6	0
185	4	2	1	27	15	11	6	2
186	4	12	17	1	11	13	9	1
187	0	8	26	0	3	12	19	0
188	1	3	30	0	3	11	20	0
189	3	13	17	1	6	16	11	1
190	1	5	28	0	2	14	18	0
191	1	7	26	0	2	16	16	0
192	2	2	30	0	3	10	21	0
193	8	5	15	6	13	9	7	5
194	1	5	27	1	2	13	19	0
195	3	14	15	2	8	17	6	3
196	1	2	1	30	6	1	1	26

APPENDIX 21

(2) continued

Operation No.	Have Done - At Work				Have Done - At Classes			
	O	A	L	N	O	A	L	N
197	4	2	1	27	5	0	3	26
198	1	4	0	29	3	3	0	28
199	2	3	0	29	3	2	0	29
200	4	1	3	26	3	2	3	26
201	16	10	5	3	18	9	4	3
202	11	4	1	18	14	3	2	15
203	10	6	1	17	13	4	1	16
204	5	6	1	22	8	3	1	22
205	4	4	1	25	8	3	1	22
206	6	6	1	21	9	4	1	20
207	7	5	1	21	10	2	1	21
208	6	4	1	23	8	3	1	22
209	5	3	5	21	6	2	5	21
210	17	6	8	3	15	13	3	3
211	15	5	7	7	17	10	3	4
212	20	6	7	1	18	11	3	2
213	9	3	7	15	19	6	3	6
214	12	7	5	10	16	10	2	6
215	12	10	9	3	14	16	3	1
216	12	8	9	5	14	13	4	3
217	14	10	10	0	12	18	2	2
218	2	9	7	16	12	12	3	7
219	5	18	11	0	10	17	7	0
220	5	18	10	1	8	16	9	1
221	5	15	13	1	9	14	10	1
222	5	17	10	2	9	19	5	1
223	5	3	23	3	8	9	14	3
224	5	0	0	29	6	5	8	15
225	3	0	0	31	1	9	8	16
226	3	0	0	31	4	5	8	17
227	6	0	0	28	5	5	8	16
228	15	5	2	12	9	5	0	20
229	17	3	1	13	13	5	1	15
230	5	3	0	26	5	2	0	27
231	7	2	0	25	7	4	1	22
232	3	18	12	1	5	20	8	1
233	6	11	9	8	7	18	8	1
234	3	11	6	14	7	19	6	2
235	8	15	9	2	10	16	8	0
236	9	11	12	2	12	12	10	0
237	11	12	9	2	13	12	9	0
238	14	9	7	4	19	10	3	2
239	16	11	6	1	16	14	3	1
240	16	6	5	7	18	8	3	5
241	19	6	7	2	15	14	3	2
242	7	16	10	1	9	15	8	2
243	13	1	5	15	14	7	2	11
244	15	9	7	3	14	15	3	2
245	9	14	9	2	7	18	7	2
246	10	10	8	6	7	18	4	5
247	8	10	13	3	8	10	13	3
248	15	9	7	3	15	13	3	3

APPENDIX 21

(2) continued

Operation No.	Have Done - At Work				Have Done - At Classes			
	O.	A	L	N	O	A	L	N
249	15	7	6	6	13	12	3	6
250	13	6	9	6	10	9	8	7
251	6	4	7	17	9	7	5	13
252	9	6	5	14	12	9	4	9
253	17	6	10	1	10	16	7	1
254	14	5	7	8	16	9	5	4
255	4	1	9	20	9	11	6	8
256	1	3	8	22	12	9	6	7
257	4	1	9	20	11	11	6	6
258	5	5	5	19	16	5	4	9
259	7	5	3	19	11	5	2	16
260	7	4	5	18	14	8	1	11
261	5	3	10	16	10	10	7	7
262	4	2	6	22	12	7	6	9
263	2	7	6	19	10	11	5	8
264	0	4	8	22	11	7	5	11
265	3	4	4	23	14	7	4	9
266	0	3	7	24	12	6	4	12
267	8	2	1	23	10	5	0	19
268	6	7	4	17	8	17	7	2
269	2	5	4	23	7	16	1	10
270	5	2	5	22	14	7	3	10
271	6	6	14	8	7	11	10	6

APPENDIX 22

Check List of Operations

O = No. of operations done by student occasionally

A = No. of operations done by students an average amount

L = No. of operations done by student a lot

N = No. of operations not done by student

Sub-Appendix No.	Group
1	15 Full-time Experimental Course Students
2	34 Royal Naval Artificer Apprentices

APPENDIX 22

(i)

15 Mechanical Engineering Craft students having completed 2^{nd} Year of a three years' full-time experimental course.

O = No. of operations done by student occasionally
A = No. of operations done by student an average amount
L = No. of operations done by student a lot
N = No. of operations not done by student

Average Age of Students = 18 years

Student No.	Firm by* whom employed	AT WORK				AT CLASSES			
		O	A	L	N	O	A	L	N
1	A	70	93	85	23	54	88	35	94
2	B	63	89	104	15	98	93	35	45
3	C	91	90	40	50	35	22	6	208
4	D	66	50	83	72	56	75	70	70
5	E	53	76	117	25	71	46	26	128
6	F	71	82	50	68	86	95	45	45
7	G	47	75	84	65	48	82	87	54
8	E	35	83	92	61	24	80	110	57
9	H	43	48	97	83	40	65	93	73
10	I	56	108	74	33	28	35	17	191
11	J	36	107	93	35	29	14	23	205
12	K	103	43	28	97	37	6	15	213
13	J	31	49	163	28	71	45	77	78
14	K	62	55	70	84	39	45	38	149
15	L	64	76	82	49	73	70	51	77

* i.e. the 15 students worked for 11 different firms

Average Never Done = 52·5

Average Never Done = 112·5

APPENDIX 22

(2)

34 Royal Naval Artificer Apprentices having completed a three years' Naval Apprenticeship

O = No. of operations done by student occasionally
A = No. of operations done by student an average amount
L = No. of operations done by student a lot
N = No. of operations not done by student

Average Age of Students = 19 years 2½ months

Student No.	AT WORK				AT CLASSES			
	O	A	L	N	O	A	L	N
1	76	67	67	61	94	76	54	47
2	90	33	35	113	106	39	33	93
3	52	63	90	66	79	126	28	38
4	55	54	98	64	113	71	32	55
5	82	107	34	48	92	117	25	37
6	74	57	72	68	129	75	8	59
7	50	72	129	20	137	85	27	22
8	21	48	107	20	30	42	97	27
9	80	68	58	65	102	77	18	74
10	60	50	81	80	43	57	102	69
11	48	131	58	34	37	201	8	25
12	22	64	142	43	47	140	57	27
13	20	77	161	12	23	83	155	9
14	69	91	98	13	174	61	21	15
15	97	32	65	77	114	106	33	18
16	66	94	61	50	140	97	15	19
17	6	44	212	8	18	69	170	13
18	74	65	95	37	61	113	45	52
19	92	63	62	54	147	67	7	50
20	49	73	95	54	66	116	52	38
21	82	67	86	36	73	82	85	31
22	34	67	117	53	37	109	98	27
23	55	44	138	34	138	37	57	39
24	44	91	89	47	50	110	77	34
25	44	54	107	66	100	139	12	20
26	84	46	74	67	141	54	29	47
27	41	49	111	70	16	78	110	67
28	19	17	205	30	10	26	206	29
29	75	82	79	35	81	94	40	56
30	72	84	64	51	68	107	68	28
31	55	81	88	47	52	112	74	33
32	41	61	104	65	16	91	131	33
33	32	46	178	15	46	115	96	14
34	32	83	142	14	54	136	71	10

Average Never Done = 48 | Average Never Done = 37

APPENDIX 23.

Check List of Operations

Other Work Mentioned

Sub-Appendix No.	Group
Carp. (1)	34 Carpentry and Joinery Students
Carp. (2)	46 Carpentry and Joinery Students
Carp. (3)	34 Carpentry and Joinery Students
Carp. (4)	9 Carpentry and Joinery Students
Elect. (1)	79 Mining Electrical Students
Elect. (2)	34 Electrical Installation Work Students
Elect. (3)	25 Electrical Installation Work Students
Elect. (4)	34 Electrical Installation Work Students
Elect. (5)	13 Electrical Installation Work Students
Mech. (1)	25 Mechanical Students
Mech. (2)	31 Mechanical Students
Mech. (3)	9 Mechanical Students
Mech. (4)	12 Mechanical Students
Total	385 Students

APPENDIX 23

Carp (1)

CARPENTRY AND JOINERY

Other Work performed by 34 Carpentry and Joinery Students attending the Stow College of Building, Glasgow.

(1st Year - 5, 2nd Year - 16, 3rd Year - 13, Total 34)

Operation	No. of students
Portable Sheds	15
Timber Garages	15
Pivot Hung Sashes	9
Greenhouses	7
Doors - flush panel (1), use and setting of floor springs for doors (2), garages (4)	7
Glazing	3
Asbestos - walls (1), roofs (3), general (2)	6
Making of - serving hatch (1), pelmets (2), cases for exhibition work (1), fume cupboards (1), bank fittings (2), porch (1), display units (1), scenery (1), house furniture (1), window boxes (1)	12
Shop fitting	6

Other operations (no. of students in brackets)
Partitions (2), lean-to roof (1), panelling (1), apexes (1), shaping and sheeting ceilings with 2" square files (1), finishings (1), fixing false ceiling (1), building a boat (1), dormer window (2), bay window (1), demolition (1), mansarve roofs (1), office sections (1), general fitments (1), civil engineering (1), formica (2) linoleum (2), felt (1), tarring (1), concrete bunkers (1), lorry cabins (2), laminated plastic and veneer (1), aluminium sash sections (1), insulation quilting (1), hardwood floor covering (1).

APPENDIX 23

Carp (2)

CARPENTRY AND JOINERY

Other work performed by 46 Carpentry and Joinery Students attending Falkirk Technical College

(1st Year - 15, 2nd Year - 13, 3rd Year - 18, Total 46)

Operation	no. of students
Portable Sheds	21
Pivot Hung Sashes	14
Timber Garages	19
Greenhouses	7
Asbestos Roofing	7
Doors - repairing locks and door springs (1), frame and line (1), fire check (2), garage (1), sliding (1), panelled (1)	7
Sink tops, draining boards, wringer fixtures	6
Bench tops	3
Making of - coffin (1), serving hatches (1), tool boxes (1) tee square (1), office furniture (1), fume shafts (1), bar fittings (1), show case windows (1), bake boards (1), bath barrow (1)	10

Other Operations (no. of students in brackets)

Porches (2), glazing (2), in situ stairwork (2), rip saw (2), cramping sashes (2), dumpy level and theodolite (2), felting/insulating roofs (2), concrete shuttering/mould making for precast shuttering (2), shipbuilding/boat building (2), still and vat work (1), vats, hutches, joinery in chemical works (1), thresholds (1), plados (1), dooking and strapping walls (1), general repairs (1), dry rot work (1), fitting carpets/linoleum (1) fitting curtains/venetian blinds (1), working on crossbutt (1) erecting canopies (1), erecting steel material at Christmas rush for Post Office (1), steeples (1), trailers (1), bridges (1), repairing canal bridges (1), building temporary offices (1)

APPENDIX 23

CARPENTRY AND JOINERY

Carp (3)

Other work performed by 34 Carpentry and Joinery Students attending the School of Building, Cambuslang

(1st Year - 9, 3rd Year - 25, Total 34)

Operation	no. of students
Portable Sheds	30
Timber Garages	26
Pivot Hung Sashes	17
Greenhouses	18
Glazing	14
Asbestos/gyprox ceiling/sheeting	10
Preservation of timber	6
Heat and sound insulation and refrigeration	6
Louvred ventilators/circular louvres	6
Curtain walling	6
Counter construction	4
Roofs - butterfly (1), garage (1), sheeting (2)	4
Acoustic tiling	3
Doors - sliding (1), metal garage (1)	2
Plastic sheet material	3
Making - dressing tables and drawer units (1), boxmaking (1), cold frames (2)	4
Repairing - huts (1), hutches (1)	2

Other Operations

CPN Boy (1), finishing skirting facing (1), painting (1), sweeping floor (1), grounding (1), ceiling runners (1), barrackading (1), wood bonding (1), gantries etc. (1), extensive screenwork (1), framing (wire lath) (1), gutters (1), stud partitions (1), pattern making (1), steps (1), circular columns (1).

APPENDIX 23

Carp (4)

CARPENTRY AND JOINERY

Other work performed by 9 2nd Year Carpentry and Joinery Students attending the Edinburgh School of Building

Operation	no. of students
Portable Sheds	9
Timber Garages	9
Pivot Hung Sashes	9
Greenhouses	5
Glazing	2
Sink Units	2
Laying Floors	2
Strapping Walls	2

Other Operations

Armour plate doors (1), garage doors (1), shelter (1), hung ceilings (1), fibre glass (1), insulation to walls (1), heat installation (1), hatches (1), insulation glass wool (1)

APPENDIX 23

Elect (1)

ELECTRICAL STUDENTS

Other Work performed by Electrical Students

79

Operations mentioned by Mining Electrical Students at Esk Valley College, Midlothian

Mine and Quarries Regulations

Flameproof and Intrinsic Safety Appliances

Safety Circuits used in Mining

Planned Maintenance

Prime Movers

Synchronous Motors

D.C. Motors and Fan and Compressor Gear

Haulages

Wound Rotor Motors

High Tension

Electric Winders

Dynamic Braking

Large A.C. Motors

Shaft Winders

Large 3 Phase Motors

Alternators

3.3 KV Systems

6.6 KV Systems

Colliery Winding Engines

Types of Braking on Winders

Low Tension

Automobile Elect.

3 ph 550V Systems

3 ph and Neutra L and P

High Voltage

Installation of Various Medium and High Voltages

Installation of Vertical and Inclining Shaft

Low Voltage

Shaft Signals

Face Signalling system

Trace faults and repair control panels

Sequence control

Winder control

Emergency lighting (25V)

Installation of:-

Radio-Active Type Fire Alarm
Photo-Electric Cells
Burglar Alarm

Maintenance

Cable Fault Location
Fault Finding
(Trailing Cables)
(Vulcanising of Cables)

Telephones

Telephone Systems
Telephone Circuits
Auto and Magneto Telephones

Electronics

Control Circuits
Winding Control System
Installation of Magnetic Amplifiers
Electronic Control
Proximity Switches

APPENDIX 23 Contd.

Elect (1)

ELECTRICAL STUDENTS

Supply

HV and LV Distribution
3.3 KV Switchgear
(Vulcanising of Cables)
(Trailing Cables)
Underground Sub-Station Installation
Lighting Motors
Transformers
P12 CDNA
Portable app. and trailing cables
Oil Transmission Switchgear

Elect. Locomotives

Traction
Traction Batteries
Elect Locomotives

Special

Lead Acid Batteries
Battery Charging Sets

Lighting

Underground lighting

Miscellaneous

Exploders

APPENDIX 23

Elect (2)

ELECTRICAL STUDENTS

Other Work performed by Electrical Students

Operations mentioned by 34 Electrical Installation Work Students and 8 Electrical Fitting Course Students at Ramsay Technical College, Portobello

Operation	No. of students mentioning operations
Underfloor Heating/Ducting	19
Burglar/Fire Alarm	12
Battery Charging	12
Rectifier Circuits	10
Emergency lighting	9
Night store heating	8
Secondary cells	7
Construction of instrument panels	6
Bending conduit	6
Trunking	3
Telephone circuits	3
Overhead cables	3
Street lighting	3
Lightning conductors	3
Underground cables	3
Time switches	3
Stop-start buttons	2
Luminous call system	1
Orange PVC Wire Armoured Cable	1
Making brackets	1
Jointing	1
Off-peak heating	1
Refrigeration	1
High Stores	1
Elect. Schematic Drawings	1
Electro Magnetic Assembly	1

Internal/

APPENDIX 23 Contd.

ELECTRICAL STUDENTS

Elect (2) Continued.

Operation	No. of students
Internal Transport	1
Switchgear and Apparatus	1
Traying	1
Main Boards	1
Elect. Motors	1
T.L.	1
Building of Switchboards	1
Making ways	2
Raggling	1
Unistrat	2
Auto-Elect. Work	1
Wireless repairs	1
Lift circuits	1
Maintenance of turbine alternators	1
Insulation of instruments	1
Repairs	1
Charts replacements	1

APPENDIX 23

Elect (3)

ELECTRICAL STUDENTS

Other Work performed by Electrical Students

25

Operations mentioned by Electrical Installation Work Students following the City and Guilds Course A and Course B at the School of Engineering, Burnbank, Hamilton.

1st Year City and Guilds A

Student	Operation
1	Fire Alarms
2	Rewinds
	Conveyance Trucks
3	AC Controllers
	Contractor Panels
	Thermo couples
4	Flexible Conduits
	Fire Alarm Systems
	Trunking
5	Wiper motors for cars
	Pirelli (for protecting cars)
	Wylie safe load indicators
	Automobile Wiring
6	Plastic Conduit
	Plastic Trunking

2nd Year City and Guilds A

Student	Operation
1	Undercutting coils
	Setting brake switches
	Winding coils for contractor
	Tip control
2	Undercutting armature commutators
	Winding 66 BTH field coils
	Winding magnet coil
3	Trunking
	Aluminium sheath cable
	Busbar Chambers
	Building Switchgear
	Earthing
	Street lighting

1st Year City and Guilds B

Student	Operation
1	Crane Maintenance
2	Underfloor Heating
3	Underfloor Heating LCC
4	Maintenance of Elect. Clocks
5	Air circuit breakers
	Oil circuit breakers

A P P E N D I X 23 Contd.

ELECTRICAL STUDENTS Elect (3) continued

3rd Year City and Guilds A

Student	Operation
1	Machine maintenance
	Machine installation
2	Maintenance of
	- Heavy Swithhgear
	- Forklift Trucks
	- Cranes
	- AC Controllers
3	Use of transistors
	DC ~~Dioma~~ Controllers
	High Tension Oil
	Miniature Circuit Breakers
4	Maintenance of DC Cranes
	Splicing of Magnet Cables
	Maintenance of Forklift Trucks and AC and DC Control Panels
5	Crane Maintenance
	Cable Jointing (Armour)
6	Power Supply

3rd Year City and Guilds B

Student	Operation
1	Instrument Maintenance
	Fitting
	Armature Winding
2	DC Shunt Motors
	DC Contractor Control
	Sodium Lamps
	Control gear
	Mercury vapour
3	Overhaul motors
	Overhaul Generators DC and AC
	Wiring diagrams of motor etc.
	Wiring of industrial motor cars and trucks
4	Voltage regulators
	DC Generators
	Schematic Diagrams
	Wiring Diagrams of Elect. Motors
	Control Diagrams
	Load Regulators
5	Plastic Conduit Systems
	Mica Plastic Sleeving
	Diversity Factor
	Kango Hammers
	Grip Couplings

APPENDIX 23

Elect (4)

ELECTRICAL STUDENTS

Other Work performed by Electrical Students

Operations mentioned by 34 Electrical Installation Work Students following the City and Guilds Course A at Stow College of Engineering, Glasgow.

1st Year City and Guilds A

Student	Operation
1	Drawing Circuits
2	Gas/Elect/Spot Welding
	Turning
	Plating
	Fitting
	Drawing
	Drilling
	Grinding
3	Asdic
4	Telephone Extension
	Faults in various motors
5	Asdic
6	Chasing walls
7	Trunking
8	Ship Work
	Trunking
9	Making tea
	Putting in hiltipins
	Raggling wall
	Plastering holes
	Painting couplings
	Fitting fibreglass to night store heaters
10	Switchboards
	Loudspeakers
11	Electric iron
12	Amplifiers
	Valve testing
	Relays
	Solenoids
13	Underfloor heating
	Fixing up elect. signs
14	Trunking
	Limit switches
15	Raggling
	Rawlplugging
	Washboiler
	Floor heating
	Caller system

1st Year City and Guilds A (contd.)

Student	Operation
16	Elect. Clocks
17	Metalwork (Sheet and iron)
18	Earthing waterpipes together
19	Electric kettle
20	Jointing PVC
21	Wiring clock points
22	Extraction fans
	Magneto brakes
	Winch motors
	Electric Horns
	Resistances
	Winding
	Generator motors
	Contractors
	Switchboards

APPENDIX 23 Contd.

ELECTRICAL STUDENTS   Elect (4) continued

2nd Year City and Guilds A

Student	Operation
1	Electronic Controls Flow Meter Control
2	Doxone
3	Ecko Sounders Armature Winding Telephone Wiring
3	Mercury Arc Rectifiers Wiring furnaces
4	Armature Winding
5	Armature Winding Elect. and Diesel Trains
6	Armature Winding Overhaul Starter Motors Relay Panels
7	Armature Winding Starter Motors Relay Panels
8	Starter Motors Alternators Relay Panels Dragonair Heaters Oil Pressure Switches
9	Starter Motors Armature Winding Maintenance Diesels Relay Panels Rectifiers Heater Panels Dragonair Heaters Oil pressure switches Acme, final drive switches Solenoids

3rd Year City and Guilds A

Student	Operation
1	Armature Winding Starter Motors
2	Egatabs Tally plates on boards Trunking
3	Phone circuit Plumbing, e.g. fitting immersers

APPENDIX 23

Elect (5)

ELECTRICAL STUDENTS

Other Work performed by Electrical Students

13

Operations mentioned by Electrical Installation Work Students following the City and Guilds Course A and Course B at Falkirk Technical College.

1st Year City and Guilds B

Student	Operation
1	Hoist P.M. and Repair
	Weir and Davidson Press
	Eddison Starters
	Series Circuit for stop pusher
	Welding Machines
	P.M. Main Breakers
	Compressed Air Lamps
2	Hoist P.M. and Repair
	Eddison Starters
	Welding Machines
	P.M. Main Breakers
	Compressed Air Lamps
3	Repairing parts of vehicle·
	Motor engines
	Electric welding machines
4	Ship buckets, lifts, etc.
	Controllers, etc.
5	Off peak
	Internal mains
	Trunking
6	Street lighting
	LV and HV Cable Jointing
7	Off peak
	Connecting meters
	Internal mains
	Trunking work
8	Television aerial
	Underfloor heating
9	Street lighting

2nd Year City and Guilds A

Student	Operation
1	Use of time clocks
2	Meter connections
	Use of time clocks
3	Telephone installation and maintenance
	Maintenance of generator in power station
4	Meter connection
	Off peak heating

A P P E N D I X 23

MECHANICAL STUDENTS

Mech (1)

Other Work performed by Mechanical Students

Operations mentioned by 10 4th Yeat M.E.T., 13 5th Year M.S.E., and 2 H.N.C. (Final Year) Production, Students at Stow College of Engineering, Glasgow.

Inspection	10
Boring/Jig Boring	2
Drawing Office, Jig Design etc.	8
Welding (Arc/Gas/Elect.)	10
Labouring	3
Flat surfaces - lapping (2), honing (3)	5
Burning (5), brazing (2)	7
Cylindrical/internal grinding	2
Die - fitting/casting	2
Maintenance(elect. furnaces, gas plant, machines, fitting)	4
Tool fitting, checking of jigs, m/c toolsetting, press toolwork	4
Hydraulics use/maintenance	1
Radial drill	1
Applied mechanics	1
Applied heat	1
Elect. engineering	1
Making tea	1
Cleaning up	1
Hoist and crane engineer	1
Electric trucks/maintenance	1
Investigation	1
Erection of steel	1
Simple wiring motors	1
Engine work	1
Circuit testing	1
Plating	1
End milling	1
Special purpose machine	1
Assembly fixtures bench	2
Capstan fixtures	2
Sintered metals	1
Production control	1

APPENDIX 23

MECHANICAL STUDENTS   Mech (2)

Other work performed by Mechanical Students

31

Operations mentioned by Students at Esk Valley College, Midlothian

13 First Year Mining Mechanical Students

Greensand Moulding
Arc Welding
Gas Welding
Electrical Installation
Electronics

1 Third Year Mining Mechanical Student

Disc Shearers
Conveyors
Steam Boilers
Locos (Diesel, Elec.)
Hydraulics
Pumps
Winders

6 Fourth Year Mining Mechanical Students

Steam Boilers
Conveyors
Coal Cutting Machines
Hydraulics
Compressors
Haulage Engines
Haulages
Pumps
Locos (Diesel, Elect.)
Air Compressors
Steam Winders
Electric Winders
Portable Haulers
Installations

1 O.N.C. Mining Mechanical Student

Welding
Diesels, maintenance

3 O.N.C. Straight Mechanical Students

Elect. Welding
Oxyacetylene Cutting
Motor fitting
Fault finding
Engine Turning
Boiler Testing
Rope Testing
Brazing, Welding
Dismantle, Make Detailed Parts
Drawing, Overhaul and Assemble
Hydraulic Braking System
Progressing
Mining Surveying
Transport Garage Mechanic's Work

3 Second Year M.E.C.P. Students

Welding
Soldering
Brazing

4 Third Year M.E.T. Students

Internal Micrometer
Micromag
Slips
Lapping
Honing
Capstan Work
Fitting on cylindrical grind
to ·0002" and ·0004"
Taper grinding to close limits
Assembling
Assembly of jigs and fixtures
Working with automatics
Use of die heads
Use of profile lathe
Drilling eccentric holes

APPENDIX 23 Mech (3)

MECHANICAL STUDENTS

9

Other Work performed by Mechanical Students

Oper tions mentioned by 4 4th Year M.S.E. and 5 O.N.C., O2 (Production) Students at the School of Engineering, Burnbank, Hamilton.

Welding, including arc and gas
Broaching
Centreless [illegible] grinding
Production of similar parts
Diamond turning
Use of milling fixtures
Use of turning
Slotting
Spline shaping
Jig boring
Horizontal boring
Horizontal buller
Vertical buller
Drawing, foundry, making moulds
Repairing furnace roof
Repairs to clogging and billet mill
Gear cutting machines
Profile lathes
Patternmaking

APPENDIX 23 Mech (4)

MECHANICAL STUDENTS

12

Other Work performed by Mechanical Students

Operations mentioned by 3 1st and 9 2nd Year M.E.T. Students at Ramsay Technical College, Portobello.

Inspection
Gear/Instrument Assembly
Drawing/Designing
Elect./Radar Assembly
Gear Cutting
Capstan Lathe
Auto Lathe
12 Station Punch
Tape Milling
Centreless Grinding
Broaching
Tapping Machines
Screw Cutting
Development
Experiments
Radio Fitting
Instrument Fitting
Diaforming Surface Grinder
Filing Machine
Tap disintegrator ultrasonic
Computer mills
Packing steam valves
General diesel maintenance
Air Compressors
Pipe Fitting work
Oxy and Gas Welding
Pumps
Turbines
Heat exchangers
Micro finishes
Engraving
Moulding
Spot Welding

APPENDIX 24

Employment Records

of

5 Electrical Tradesmen

who had completed all or nearly all

130 operations at work.

APPENDIX 24

ELECTRICAL STUDENTS

Employment Record of 5 Electrical Tradesmen who had completed all or nearly all 130 operations at work.

Tradesman 1 Age : 30 years 9 months All 130 operations done at work

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving
Pre-Apprentice Course	April 49	Oct 49	Electrical and Mechanical Engineering.	Education Grant	16 years of age
S.E.S.E.B. 3 years Evening Classes 5 Years Apprenticeship	Oct 49	Oct 54	Installation, Domestic, Industrial		National Service
2 Years Royal Signals	Nov 54	Oct 56	Maintenance and Repairs, Field Generators		
S.E.S.E.B.	Nov 56	Sept 57	As above	£9.10/-	
N.C.B. Fleets Colliery, Tranent	Sept 57	Aug 59	Colliery Installation and Maintenance	£13.2.6d.	Nearer home
N.C.B. Bilston Glen Colliery Loanhead, Day Release	Aug 59	Present	Colliery Installation	£14.2.6d.	

Tradesman 2/

APPENDIX 24

ELECTRICAL STUDENTS (contd.)

Tradesman 2 — Age : 34 years 7 months — All 130 operations done at work

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving
J. Menzies & Co. (Bookseller)	1944	1945	Book collector	£1. 5.0d.	To begin apprenticeship
J. B. McKenzie (Electrical Contractor)	1945	1950	Apprentice Electrician		National Service
National Service	1950	1952	Radio Operator		National Service
J. Scott & Co. (Electrical Contractors	1952	1956	Electrician	£9.	Involved travelling away from home for long periods.
N.C.B.	1956	(1964) to date	Electrician	£15.	

APPENDIX 24

ELECTRICAL STUDENTS (contd.)

Tradesman 3   Age 33 years 11 months   All but 3 of the 130 operations done at work

Firm, Full-time Education, etc.	From	To	Type of work	Wages	Reason for Leaving
Edwardson & Son.	8.8.45	30.4.51	Contracting, Repair and Maintenance		More Money
Drailey Gorham	31.4.51	26.6.51	Contracting		National Service
J. Plucknett & Co.	9.9.53	18.2.57	Contracting		To be nearer home
N.C.B. Newbattle C.W.S.	21.2.57	8.8.58	Maintenance	£12	Money
N.C.B. Roslin Colliery	11.8.58	(1964)	Maintenance	£16	Present Employment

APPENDIX 24

ELECTRICAL STUDENTS (contd.)

Tradesman 4 — Age : 27 years 2 months — All but 5 of the 130 operations done at work

Firm, Full-time Education, etc.	From	To	Type of Work	Wages	Reason for Leaving
Charles Kelly & Co. Limited. Electrical Engineers and Armature Winders	1952	1958	Electrical Installation	£10.13/-	-
N.C.B.	1958	(1964) to date	Maintenance	£14. 2.6.	-

Tradesman 5 — Age : 30 years 2 months — All but 7 of the 130 operations done at work

Electricity Board	6.5.50	0.6.57	Contracting	£12.	more experience
N.C.B.	0.6.57	(1964)	Maintenance	£16	-

APPENDIX 25

Operations never done

Explanations offered by experienced tradesmen

and teachers

Sub-Appendix No.		Group
Carp.	(1)	31 Carpentry and Joinery Tradesmen
Elect.	(1)	29 Electrical Tradesmen
Mech.	(1)	11 Mechanical Engineering Craft Practice Students
Mech.	(2)	14 Mechanical Engineering Technicians (Block Release Students)
Mech.	(3)	19 Machine Shop Engineering Students
Mech.	(4)	34 Royal Naval Artificer Apprentices

APPENDIX 25

CARPENTRY AND JOINERY

Carp (1)

Operations never done by 31 older students

Explanations offered by experienced tradesmen, builders and teachers of Carpentry and Joinery

Operation 11	- not likely to be done outside own trade
Operation 25	- Woodcutting Machinist job
Operation 42	- At Work - brought in prepared
Operation 66	: At Classes - not suitable for doing at classes
Operation 74	: At Work - only encountered occasionally
Operation 81	: At Work - only encountered occasionally
Operations 86 to 94	: At Work - large firms only
Operations 86 to 94	: At Classes - selected models (and students) only, because of time and expense.
Operations 89, 90	: At Classes - would only do a drawing
Operation 91	: At Classes - done by roadworkers; joiners come to see
Operations 92, 93, 94	: At Classes - selected models, etc.
Operations 91, 93, 94	: tubular steel coming in
Operations 97 to 101	: At Classes - selected models, etc.
Operation 106	- obsolete
Operations 108 to 111	: At Classes - selected models, etc.
Operation 113	: At Classes - not much opportunity
Operations 119 to 125	: At Classes - going out, one per class for group demonstration
Operations 127, 128	: At Classes - need door standards
Operations 132, 133	: At Classes - selected models, etc.
Operations 134 to 146	: At Work - done in very few shops
Operations 134 to 146	: At Classes - selected models, etc.
Operations 165 to 172	: At Work - likely to be met in small jobbing shops but not in big industrial firms
Operations 165 to 172	: At Classes - selected models, etc.

APPENDIX 25

ELECTRICAL STUDENTS Elect (1)

Operations never done by 29 tradesmen

Explanations offered by experienced tradesmen, engineers and teachers of electrical subjects.

Operation 7	: At Classes - dying out, found perhaps in shipyards
Operation 13	: At Classes - this is domestic whereas NCB students do power/flameproof
Operation 23	: At Work - depends on firm, not NCB
Operation 24	: At Work - domestic, relevant to SSEB but not NCB At Classes - lack of equipment
Operation 26	: rarely required
Operation 28	: essential for domestic/commercial but not power equipment. At Classes - basic essential instruction, not NCB
Operation 38	: not much in practice
Operations 57 to 70	: At Work - all basic. Lighting, signals, cable-jointing etc. specialist jobs. At Classes - would be costly, discussion/demonstration only
Operations 71 to 73	: large firms only
Operations 76 to 78, 80 and 81 - type of work not NCB	
Operation 83	: At Classes - blowlamps going out, butane torches now
Operation 92	: not likely to occur in practice, NCB not much
Operations 96,100,101	: At Work - essentially theory
Operation 103	: At Classes - obsolete in general practice apart from appliances (vacuum cleaners etc.) Chemical industries etc. use. Tendency towards AC motors without brush gear.
Operation 105	: At Work - more theory. Limitation of use of DC machines.
Operation 106	: ditto
Operation 115	: At Work - D.C. equipment
Operation 122	: At Work - not likely with separate control gear
Operation 126	: nature of work, not NCB
Operations 127 to 129	: At Work - type of work, not NCB. At Classes - cost of equipment, demonstration

APPENDIX 25

Mech (1)

MECHANICAL STUDENTS

Operations never done by 11 mechanical engineering craft practice students who had completed the 4th Year of the M.E.C.P. City and Guilds Course.

Explanations offered by experienced tradesmen, engineers and teachers of Mechanical Subjects.

Operation 8	: May be due to misunderstanding where teacher did not explain that "construction" meant "instruction on construction".
Operation 27	: Sheetmetal workers' trade
Operations 28 and 29	: At Classes - students are told about this
Operations 30, 31, 32, and 33	: At Work - Blacksmith's trade
Operation 51	: At Classes - students are told about this
Operation 54	- this is jobbing, not production
Operation 66	: At Classes - students are told about this
Operations 95 and 96	- Sheetmetal worker's trade
Operations 97 and 98	- Blacksmith's trade
Operation 118	: At Classes - this is theory
Operation 141	- Students are told about this
Operation 149	- Industrial or jobbing work
Operation 150	- Students are told about this
Operations 151 and 152	- this is theory
Operations 147 to 152	- Industrial or jobbing work, specialist in large firm
Operation 161	: At Classes - less common than portable electric drill
Operations 176 and 177	- only occasional use
Operation 185	- Toolroom work
Operation 189	- only occasional
Operation 193	- Jobbing work
Operation 195	- Incorporated in the modern lathe
Operation 196	: At Classes - "no planing machine in the college"
Operation 197 to 200	: At Work - machine operator may be a tradesman and no opportunity for trainee to operate machine

APPENDIX 25 Contd.

MECHANICAL STUDENTS Mech (1) continued

Operations 204 to 209	: At Work - as for 197 to 200 At Classes - slotting attachment fitted to milling or shaping machine in college
Operations 224 to 226	- Applies to maintenance engineer or millwright
Operation 227	: At Classes - this is theory
Operation 229	: At Classes - this is taught rather than done
Operations 230 and 231	: At Classes - as for 229
Operations 234 and 235	- e.g. machine vices, not common locally unless a specialist manufacturer
Operation 237	: At Work - not apprentices
Operation 239 and 240	: At Work - depends on type of firm, toolroom work
Operation 241	: At Work - machine shop work. At Classes - time-consuming
Operation 243	- castings from foundry department. At Classes - no forging produced in college
Operations 248 to 250	- this is theory
Operations 251 to 253	- jobbing, toolroom
Operation 268	: At Classes - e.g. one machine to 16 students - limited opportunity

APPENDIX 25

Mech (2)

MECHANICAL STUDENTS

Operations never done by 14 mechanical engineering block release (5 weeks) students who had completed the 3rd Year of the MET City and Guilds Course

Explanations offered by experienced tradesmen, engineers and teachers of Mechanical Subjects

Note: The answers are based on the MECP Course which these students do not follow. These technicians do laboratory work as against the practical work of the MECP craftsmen. It is consequently normal that they should not have covered the MECP classroom work. Observations are therefore confined to the operations they have not done at work.

Operation 6	: craftsman's work, not technician
Operation 8	- explanation, rather than actual construction
Operation 26	- craftsman's work
Operations 27 and 28	- sheetmetal work
Operations 30 to 33	- blacksmith's work
Operations 32 and 33	- relatively few firms on this type of work
Operation 51	- maintenance engineer's work
Operation 54	- this is a basic essential
Operations 65 to 67	- maintenance engineer's work
Operation 71	- depends on type of industry, unusual work
Operation 74	- obsolete, seldom used
Operation 79	- this is theory
Operations 80 to 84	- theory
Operation 90	- theory
Operation 91	- not expected that they should produce accurate work like the craftsmen
Operation 94	- theory
Operations 95 and 96	- sheetmetal work
Operations 97 to 99	- not common, only rarely done
Operations 101 to 104	- not a production machine but used quite extensively in toolroom
Operations 102 to 104	- maintenance engineer's work
Operation 105	- only occasional

APPENDIX 25 Contd.

MECHANICAL STUDENTS Mech (2) continued

Operations 107 and 109	- theory
Operations 110 to 115	- craftsman's work
Operations 117 to 119	- craftsman's work
Operations 137 to 140	- used more in machine tool industry and maintenance departments
Operations 139 to 146	- not technician's work
Operations 147 to 152	- theory
Operations 153 to 165	- craftsman's work
Operations 166 to 173	- theory
Operations 178 and 179	- craftsman's work, done in theory
Operation 185	- toolroom work
Operation 189	- only occasional
Operation 193	- jobbing work
Operation 196	- not technician's work
Operations 197 to 200	- craft theory
Operations 201 to 209	- craftsman's work
Operations 212 and 213	- not done much
Operation 222	- craftsman's work
Operations 224 to 226	- applies to maintenance engineer or millwright
Operations 227 to 231	- craftsman's work
Operations 232 to 235	- theory
Operations 236 and 237	- craftsman's work
Operations 239 and 240	- toolroom work
Operations 246 and 249	- maintenance engineer's work
Operations 251 to 253	- jobbing, toolroom work
Operations 256 to 258	- theory
Operations 259 to 261	- maintenance engineer's work
Operation 269	- theory
Operation 271	- craftsman's work

APPENDIX 25 Mech (3)

MECHANICAL STUDENTS

Operations never done by 19 machine shop engineering day release students who had completed the ONC, 02 Production Year of the MSE City and Guilds Course.

Explanations offered by experienced tradesmen, engineers and teachers of Mechanical Subjects.

Note: The answers are based on the MECP Course which these students do not follow. It is normal that they should not have covered the MECP classroom work, and observations are therefore confined to the operations they have not done at work.

Operation 7	: unnecessary, maintenance mechanic's work
Operations 27 to 33	: not production work, sheetmetal and blacksmith's work
Operation 74	- obsolete
Operation 79	- theory
Operations 80 to 84	- depends on type of work/industry
Operations 90 and 94	- theory
Operations 95 and 99	- sheetmetal work
Operations 102 and 103	- not production work, maintenance engineer's work
Operation 118	- only done occasionally
Operation 138	- depends on type of production, e.g. batch production
Operations 148 to 151	- depends on type of work
Operations 156 to 162	- not production work
Operation 164	- depends on type of work e.g. car factory
Operations 180 to 182	- theory
Operation 185	- toolroom work
Operation 189	- only occasionally
Operation 193	- jobbing work
Operation 194	- not production work
Operations 196 to 200	- not production work
Operations 201 to 209	- not production work
Operations 210 to 214	- depends on type of work

APPENDIX 25 Contd.

MECHANICAL STUDENTS Mech 3 continued

Operations 224 to 227	- not production work
Operations 230 and 231	- not production work
Operation 234	- specialist manufacturer, theory
Operation 235	- theory
Operations 236 and 237	- only occasional
Operations 239 and 240	- jigs, fixtures etc. but not here, toolroom/jobbing work
Operations 241 and 242	- toolroom work
Operation 243	- jigs and fixtures eliminating second operation
Operations 248 and 250	- theory
Operations 251 to 253	- jobbing/toolroom work, would use other tools, e.g. broaching machines
Operation 269	- theory

APPENDIX 25

MECHANICAL STUDENTS Mech (4)

Operations never done by 34 Royal Naval Artificer Apprentices who had completed a three years' Naval Apprenticeship.

Explanations offered by Naval Officers responsible for the training of these apprentices.

Operation 32	:	Brief acquaintance only with forging (Lathe Tools). Forges are only fitted in a few large repair ships.
Operation 65	:	Possible shortcoming in our syllabus.
Operation 74	:	Shortcoming of syllabus which is being corrected.
Operation 95, 96	:	Shipwright Artificer work. Brief acquaintance only is given in sheet metal work.
Operation 97	:	This should not have been so and is certainly not now.
102	:	The maintenance of machinery in general is covered in the Marine Engineering syllabus. Specific reference to workshop machinery is not made.
Operation 140, 141	:	This is now being introduced into syllabus.
Operation 150, 151, 152	:	Time! It is hoped to introduce a W. T. class demonstration of these points.
Operation 161, 162, 163, 164	:	Specific instruction not considered necessary.
Operation 171, 172, 173	:	Use is made of the type of lathe tool likely to be found at sea. This type of tool is unfortunately a rarity in a ship.
Operation 177	:	No time in syllabus.
180/		

Operation 180 – 182	:	No time in syllabus - morse taper only taught as it is the one most likely to be met.
Operation 185	:	Taper timing attachment not normally available in fleet.
Operation 196 - 209	:	Planing machines are not available in the fleet and shaping machines only in larger vessels.
Operation 210 - 222	:	Milling machine only occasionally available in fleet. Acquaintance only is attempted.
Operation 224 - 231	:	Installation of W/S machinery is a Dockyard commitment. Lifting and Slinging is a possible shortcoming in syllabus.
Operation 233 – 234	:	This type of threadonly rarely met in fleet.
Operation 243 - 254	:	See 210 - 222.
Operation 255 - 270	:	Grinding machines rarely met in fleet.

APPENDIX 26

Age in relation to year of course/type of course/group

364 Carpenters and Joiners

Age → Year of course ↓	15	16	17	18	19	20	21	22	23	24	Total
First	2	23	65	39	8	1					138
Second		2	25	43	24	9	1				104
Third			5	25	28	22	4				84
Fourth					11	7	3				21
Fifth						5	9	2		1	17
Total	2	25	95	107	71	44	17	2		1	364

The age is at the end of June 1964, i.e. the end of the college year. Thus of the fourth year students at college, 11 were between 18 years 6 months and 19 years 6 months at the end of June 1964 (i.e. they were born in 1945); by age is meant the half-year below to the half-year above.

APPENDIX 26 (continued)

Elect.

481 Electrical Students

Age x Type of College Course and Group

Group → / ↓ Age	1	2	3	4	5	6	7	8	9	10	Total
16	16					2		1			19
17	71	7				48	1	8			135
18	36	36	5			34	15	8	13		147
19	8	22	13			1	8	5	8	2	67
20	2	12	22	2				3	1	3	45
21	1	3	12	4	1			2		4	27
22		1	4	2	5						12
23		1			3						4
24				2	4						6
25					2						2
26-28			2	1	2						5
29-31					1						1
32-34			1		7						8
35 +					3						3
Total	134	82	59	11	28	85	24	27	22	9	481

Groups

1 = 1st Year Elect. Inst. A
2 = 2nd Year Elect. Inst. A
3 = 3rd Year Elect. Inst. A
+ 3rd Year Mining Elect.
4 = 4th Year Mining Elect.
5 = 5th Year Elect. Inst. A
+ 5th Year Mining Elect.
+ SSEB Tradesmen
6 = 1st Year Elect. Inst. B
7 = 2nd Year Elect. Inst. B
8 = 1st Year Elect. Fitting
9 = 2nd Year Elect. Fitting
10 = 3rd Year Elect. Inst. B

Note: 16 means between $15\frac{1}{2}$ and $16\frac{1}{2}$, etc.

APPENDIX 26 (continued)

Mech.

372 Mechanical Students

Age x Type of College Course and Group

Group / Age	1	2	3	4	5	6	7	8	9	Total
16	23									23
17	28	12				12	6	1	3	62
18	12	40	9			11	3	5	8	88
19	5	5	11	29		3	2	7	22	84
20			6	24	10		1	5	10	56
21			2	11	21		2			36
22			1		8					9
23			1		2					3
24					1					1
25					3					3
26-28							1			1
29-31							3		1	4
32-34							1		1	2
Total	68	57	30	64	45	26	19	18	45	371

Note : 16 means between $15\frac{1}{2}$ and $16\frac{1}{2}$, etc.

Groups

1 = 1st Year MECP (40)
+ 1st Year Mining Mech.(13)
+ Pre-Apprentices (15)

2 = 2nd Year MECP (57)

3 = 3rd Year MECP (24)
+ 3rd Year Mining Mech.(6)

4 = 4th Year MECP (16)
+ 4th Year ONC (3)
+ 4th Year MSE (11)
+ Admiralty (34)

5 = 5th Year Mining Mech. (1)
+ 5th Year MSE (30)
+ HNC Production (14)

6 = 1st Year MET (26)

7 = 2nd Year MET
+ 2nd Year Mining Mech.

8 = 3rd Year MET (18)

9 = 4th Year MET (23)
+ 4th Year ONC Mining Mech. (7)
and Production (15)

APPENDIX 27

Expected Years at College and Course Taken

A comparison was made between the date each student started his college studies and the date he gave as expecting to complete his studies. The results for the various groups are given below, a zero (0) for expected number of years at college or for course meaning "not recorded". In a number of cases where the expected time at college is excessively short, it appears that the teacher indicated to the class that they should record the end of the current session. Similarly, the date of starting classes is not fully reliable since some have used it to indicate the start of the current session.

Group Tables 11 to 39 : Expected Years at College and Course Taken

A) Carpenters and Joiners

Code: Course 1 = Carpentry and Joinery

Group 11 (1st Year)

Expected Years at College	Course 1
0	1
1	4
2	6
3	105
4	8
5	13
6	1

Total 138

Group 12 (2nd Year)

Expected Years at College	Course 1
1	1
2	3
3	92
4	2
5	5
9	1

Total 104

APPENDIX 27 (contd.)

Group 13 (3rd Year)

Expected Years at College	Course 1
1	1
2	9
3	45
4	12
5	16
6	1

Total 84

Group 14 (4th + 5th Year)

Expected Years at College	Course 1
3	1
4	16
5	14
7	3
8	1

Total 38

B) Electricals

Code: 2 = Elect. Installation Course A

3 = Elect. Installation Course B

4 = Elect. Fitting

5 = Mining Elect. Engineering

Group 20 (3rd Year)

Expected Years at College	Course 3
4	5
5	2
6	2

Total 9

Group 21 (1st Year)

Expected Years at College	Course 2	5
0	100	15
2	14	
3	4	

Total 133

APPENDIX 27 (contd.)

Group 22 (2nd Year)

Expected Years at College	Course 2	5
0	38	
2	3	1
3	9	2
4	4	8
5	3	3
6		11

Total 82

Group 23 (3rd Year)

Expected Years at College	Course 2	5
0	11	
3	5	
4	10	1
5	4	5
6		12
7		6
8		4
9		1

Total 59

Group 24 (4th Year)

Expected Years at College	Course 2	5
0	2	
2		1
4		2
5		7
6		9
7		1
8		2
9		2

Total 26

Group 25 (5th Year)

Expected Years at College	Course 0	2
0	9*	2
1	1	
2	1	1
3	1	
4		1
5		1
6		1

* SSEB

Total 18

APPENDIX 27 (contd.)

Group 26 (1st Year)

Expected Years at College	Course 3
0	20
2	3
3	52
4	7
5	2
6	1

Total 85

Group 27 (2nd Year)

Expected Years at College	Course 3
0	24

Total 24

Group 28 (1st Year)

Expected Years at College	Course 4
2	9
3	16
4	2

Total 27

Group 29 (2nd Year)

Expected Years at College	Course 3	Course 4
2		2
3	1	19

Total 22

C) Mechanicals

Code:

6 = Mechanical Engineering Pre-Apprenticeship Course

7 = Mechanical Engineering Craft Practice

8 = Mechanical Engineering Technician

9 = Mining Mechanical Engineering

10 = Machine shop Engineering

11 = Production Engineering

12 = Admiralty Course

13 = Admiralty Course + ONC (Mech.Eng.)

Group 31 (1st Year)

Expected Years at College	Course 6	7	9
0	15	4	12
4		27	
5		9	1

Total 68

Group 32 (2nd Year)

Expected Years at College	Course 7
2	1
3	19
4	20
5	15
6	2

Total 57

Group 33 (3rd Year)

Expected Years at College	Course 7	9
2	2	
3	10	1
4	9	3
5	3	1
6		1

Total 30

Groups 34 and 35 (4th + 5th Year)

Expected Years at College	Course 7	9	10	11	12	13
0		1	2	1	21	11
2						1
3			7			1
4	9		11	1		
5	6		18	2		
6	1	6	3	4		
7		1		3		
8				2		

Total 112

APPENDIX 27 (contd.)

Group 36 (1st Year)

Expected Years at College	Course 8
1	5
2	9
4	2
5	10

Total 26

Group 37 (2nd Year)

Expected Years at College	Course 8	9
0		7
2	1	
3	1	
4	3	
5	4	1
6	1	
7		1

Total 19

Group 38 (3rd Year)

Expected Years at College	Course 8	9
2	2	
3	1	1
4	4	
5	9	
6	1	

Total 18

Group 39 (4th Year)

Expected Years at College	Course 8	9	11
4	4	2	2
5	3	1	14
6	6		2
7	7		
8	3		1

Total 45

APPENDIX 28

Examination performance (T Score) and Method of Obtaining Apprenticeship

The examination performance (T Score) was compared with the answer to the question "How did you obtain your apprenticeship?" The details for 1156 students (362 carpenters and joiners, 479 electricals, and 315 mechanicals) are given below.

A) Carpenters and Joiners

Code: (How did you obtain your apprenticeship?)

0 = Unrecorded　　1 = Own Initiative　　2 = Friend or Relative

3 = Employer's Initiative　　4 = Youth Employment Officer

5 = Answered Advertisement　　6 = Written Application

7 = School Teacher　　8 = School of Building

Group 11/

Carpenters and Joiners

Group 11 1st Year

T	Method of getting App/Ship								
Score	0	1	2	3	4	5	6	7	8
-	-	4	7	2	3	-	-	1	-
10-19	-	-	-	-	-	-	-	-	-
20-	-	-	3	1	1	-	-	-	-
30-	1	-	5	-	1	-	-	-	-
40-	-	7	9	2	3	1	-	1	-
50-	-	9	13	1	4	1	1	1	-
60-	-	10	12	3	1	-	-	-	3
70-	-	2	6	1	2	-	1	2	3
80-	-	2	5	-	-	-	-	-	1
90-	-	-	1	-	-	-	-	-	-
Total	1	34	61	10	15	2	2	5	7

137

Group 12 2nd Year

T	Code								
Score	0	1	2	3	4	5	6	7	8
-	-	-	1	-	-	-	-	-	-
10-19	-	1	-	-	-	-	-	-	-
20-	-	2	1	1	-	1	-	-	-
30-	-	-	2	-	1	-	-	-	-
40-	-	4	5	2	1	1	1	-	-
50-	-	14	9	5	1	1	3	2	-
60-	1	10	12	1	3	1	-	-	-
70-	-	7	5	3	-	1	-	-	-
80-	-	-	-	-	1	-	-	-	-
90-	-	-	-	-	-	-	-	-	-
Total	1	38	35	12	7	5	4	2	-

104

Group 13 3rd Year

T	Code								
Score	0	1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	-	-	-
10-19	-	-	-	-	-	-	-	-	-
20-	-	3	1	-	-	-	-	-	-
30-	-	4	-	3	1	2	-	-	-
40-	-	1	5	1	1	-	-	-	-
50-	-	8	5	3	-	-	-	-	1
60-	1	14	4	3	1	-	1	-	-
70-	-	7	1	3	2	1	-	1	-
80-	-	2	1	-	3	-	-	-	-
90-	-	-	-	-	-	-	-	-	-
Total	1	39	17	13	8	3	1	1	1

84

Group 14 4th Year

T	Code								
Score	0	1	2	3	4	5	6	7	8
-	-	1	-	-	-	-	-	-	-
10-19	-	-	-	-	-	-	-	-	-
20-	-	-	-	-	-	-	-	-	-
30-	-	-	-	-	-	-	-	-	-
40-	-	-	-	-	-	-	-	-	-
50-	-	-	1	-	1	-	1	-	-
60-	1	6	7	-	1	1	1	2	-
70-	1	1	1	3	1	-	-	1	-
80-	-	1	2	2	1	-	-	-	-
90-	-	-	-	-	-	-	-	-	-
Total	2	9	11	5	4	1	2	3	-

37

APPENDIX 28 (contd.)

B) Electrical Students

Code: ditto, except 8 = School of Engineering

Group 21 1st Yr. E.I.A.

T Score	Code								
	0	1	2	3	4	5	6	7	8
-	-	-	-	-	5	-	-	4	-
10-19	-	-	-	-	-	-	-	-	-
20 -	1	2	3	1	-	-	-	-	-
30 -	1	3	3	3	-	1	-	-	-
40 -	2	9	6	3	5	2	-	1	-
50 -	3	9	12	2	4	1	-	1	-
60 -	-	6	7	5	2	5	1	1	-
70 -	2	4	2	1	1	3	-	-	-
80 -	-	1	2	1	-	-	-	1	-
90 -	-	-	-	-	-	1	-	-	-
Total	9	34	35	16	17	13	1	8	-

133

Group 22 2nd Yr. E.I.A.

Code								
0	1	2	3	4	5	6	7	8
-	2	2	1	5	3	-	1	2
-	-	-	-	-	-	-	-	-
-	1	-	-	1	-	-	-	-
-	3	-	2	2	4	-	-	-
-	4	2	-	4	3	-	-	-
1	5	6	2	3	3	-	-	-
-	3	2	1	-	3	-	-	-
-	3	2	2	-	2	-	-	1
-	-	1	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
1	21	15	8	15	18	-	1	3

82

Group 23 3rd Yr. E.I.A. + 3rd Yr. Mining

T Score	Code								
	0	1	2	3	4	5	6	7	8
-	-	1	-	-	4	1	-	-	-
10-19	-	-	-	-	-	-	-	-	-
20 -	-	1	-	-	-	-	-	-	-
30 -	-	-	1	-	-	-	-	-	-
40 -	-	2	2	1	-	1	-	1	-
50 -	-	9	3	1	-	3	-	-	1
60 -	-	7	2	1	3	3	-	-	-
70 -	-	2	-	-	2	2	-	-	-
80 -	1	2	-	-	-	1	-	-	-
90 -	-	-	-	-	-	-	-	1	-
Total	1	24	8	3	9	11	-	2	1

59

Group 24 4th Year Mining

Code								
0	1	2	3	4	5	6	7	8
-	-	-	-	2	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	1	-	-	-	-	-	-	-
-	6	-	1	1	-	-	-	-
-	3	1	-	1	-	-	-	-
-	2	-	-	2	2	-	-	-
-	1	-	-	-	1	-	-	-
-	-	-	-	-	1	-	-	-
-	-	-	-	-	1	-	-	-
-	13	1	1	6	5	-	-	-

26

APPENDIX 28 (contd.)

Group 20 3rd Yr. E.I.B.

T Score	Code 1	2	3	4	
40-49	1	1	–	–	
60-69	1	–	1	–	
70 –	2	–	–	1	
80 –	1	–	–	–	
90 –	–	1	–	–	
Total	5	2	1	1	(9)

Group 25

T Score	Code 1	2	3	4	
–	3	11	1	3	(18)

5th Year E.I.A.
+ 5th Year Mining
+ S.S.E.B. Tradesmen

Group 26 1st Yr. Elec.Inst.B.

T Score	Code 0	1	2	3	4	5	6	7	8	
–	–	4	1	–	7	2	1	1	–	
10-19	–	2	3	3	–	–	–	–	–	
20 –	–	5	2	–	–	–	–	–	–	
30 –	–	4	2	1	–	–	1	–	–	
40 –	–	2	2	1	2	–	–	–	–	
50 –	–	2	4	3	–	1	–	–	–	
60 –	–	4	2	3	1	1	–	2	–	
70 –	–	2	–	–	1	1	–	–	–	
80 –	–	2	–	1	1	1	–	–	–	
90 –	–	–	–	1	–	–	–	–	–	
Total	–	27	16	13	12	6	2	3	–	(79)

Group 27 2nd Year E.I.B.

Code 0	1	2	3	4	5	6	7	8	
–	2	–	–	–	–	–	–	–	
–	5	1	–	–	–	–	–	–	
–	5	2	–	1	2	–	–	–	
1	1	1	–	–	1	–	–	–	
–	2	–	–	–	–	–	–	–	
1	15	4	–	1	3	–	–	–	(24)

Group 28 1st Year Elect.Fitting

T Score	Code 0	1	2	3	4	5	6	7	8	
–										
10-19	–	1	1	–	–	–	–	–	–	
20 –										
30 –	–	1	–	–	2	–	–	–	–	
40 –	–	1	–	–	–	–	–	–	–	
50 –	–	3	1	1	1	1	–	1	–	
60 –	–	3	3	1	2	–	–	1	–	
70 –										
80 –	–	–	1	–	–	–	–	–	–	
90 –	–	2	–	–	–	–	–	–	–	
Total	–	11	6	2	5	1	–	2	–	(27)

Group 29 2nd Yr. Elect.Fitting

Code 0	1	2	3	4	5	6	7	8	
–	–	–	–	1	–	–	–	–	
–	1	–	–	–	–	–	–	–	
–	1	2	1	–	–	–	–	–	
–	1	2	2	1	–	–	–	–	
–	–	–	–	–	1	–	1	–	
–	–	–	2	1	–	–	–	1	
–	–	–	–	1	–	–	–	–	
–	1	–	1	1	–	–	–	–	
–	4	4	6	5	1	–	1	1	(22)

C) Mechanical Students

Code: As for Electricals.

Group 31 1st Year MECP + Pre-App/+1st Yr Mining

T Score	Code 0	1	2	3	4	5	6	7	8	
–	2	9	7	2	1	1	2	1	–	
10-19										
20 –										
30 –										
40 –	1	–	1	–	–	–	–	–	–	
50 –	2	–	–	1	–	1	–	1	–	
60 –	7	–	–	1	–	2	–	–	–	
70 –	1	2	–	–	–	2	–	–	–	
80 –	–	1	–	–	–	5	–	1	–	
90 –	–	–	–	–	–	2	–	–	–	
Total	13	12	8	4	1	13	2	3		(56)

Group 32 2nd Year MECP

T Score	Code 0	1	2	3	4	5	6	7	8	
–	–	8	1	–	1	3	1	1	–	
10-19	–	–	1	–	–	–	–	–	–	
20 –	–	1	–	–	–	–	–	–	–	
30 –	–	1	2	–	–	–	–	1	2	
40 –	–	3	1	–	–	–	–	–	1	
50 –	–	6	–	–	–	1	–	1	–	
60 –	2	3	–	1	1	1	–	–	1	
70 –	–	1	–	–	1	–	–	–	–	
80 –	5	1	–	–	–	–	–	–	–	
90 –	–	1	–	–	–	–	–	–	–	
Total	7	25	5	1	3	5	1	3	4	(54)

Group 33 3rd Year MECP + 3rd Yr. Mining

T Score	Code 0	1	2	3	4	5	6	7	8	
–										
10-19										
20 –										
30 –										
40 –	–	3	2	–	–	1	–	–	–	
50 –	–	–	–	–	2	1	–	–	–	
60 –	5	2	1	1	–	1	–	–	–	
70 –	6	3	–	–	–	–	–	–	–	
80 –										
90 –										
Total	11	8	3	1	2	3	–	–	–	(28)

Group 34 4th Year MECP + 4th Year ONC Mech. +4th Year MSE + Admiralty

T Score	Code 0	1	2	3	4	5	6	7	8	
–	–	4	1	–	1	3	–	2	–	
10-19										
20 –										
30 –										
40 –	–	3	1	1	1	1	–	–	–	
50 –	–	7	1	–	1	1	–	–	–	
60 –	6	8	3	1	1	2	–	–	–	
70 –	3	5	1	1	3	1	–	–	–	
80 –	2	4	3	–	1	2	–	–	–	
90 –	–	1	–	–	–	–	–	–	–	
Total	11	32	10	3	8	10	–	2	–	(76)

Group 36 1st Year Technicians

T Score	Code								
	0	1	2	3	4	5	6	7	8
-									
10-19									
20 -									
30 -									
40 -	-	-	-	-	1	-	-	-	-
50 -	-	5	-	-	-	-	-	1	-
60 -	-	8	-	-	2	-	- -	1	-
70 -	-	2	-	-	-	-	-	-	-
80 -	-	1	-	-	-	-	-	-	-
90 -	-	2	-	-	-	-	-	-	-
Total	-	18	-	-	3	-	-	2	-

(23)

Group 37 2nd Year Technicians

T Score	Code								
	0	1	2	3	4	5	6	7	8
-									
10-19	-	1	-	-	-	-	-	-	-
20 -									
30 -	-	1	-	-	-	-	-	-	-
40 -	-	4	-	-	-	2	-	1	-
50 -	-	2	-	1	-	3	-	-	-
60 -	-	3	-	-	-	-	-	-	-
70 -	-	-	-	-	-	-	-	1	-
80 -									
90 -									
Total	-	11	-	1	-	5	-	2	-

(19)

Group 39 4th Year Technicians
+ 4th Year ONC Mining
+ Production

T Score	Code								
	0	1	2	3	4	5	6	7	8
-									
10-19									
20 -	-	-	-	-	-	1	-	-	-
30 -									
40 -	2	1	-	2	-	-	1	-	-
50 -	-	3	-	-	2	-	-	2	-
60 -	3	8	1	-	1	2	-	2	-
70 -	2	1	1	-	-	-	-	2	-
80 -	-	1	-	-	2	-	-	-	-
90 -	-	1	-	-	-	-	-	-	-
Total	7	15	2	2	5	3	1	6	-

(41)

Group 38 3rd Year Technicians.

T Score	Code								
	0	1	2	3	4	5	6	7	8
-									
10-19									
20 -									
30 -									
40 -	-	3	1	1	-	-	-	-	-
50 -	-	5	-	-	-	-	-	-	-
60 -	-	3	-	-	-	1	-	-	-
70 -	-	-	-	-	1	1	-	-	-
80 -	-	1	-	-	-	-	-	1	--
90 -									
Total	-	12	1	1	1	2	-	1	-

(18)

Examination Performance (T Score) and Size of Firm

T Scores and Firms

The P (practice) and T (theory) scores could not be relied upon much except that someone with 90% was no doubt better than someone in another class with 10% but anywhere between say 35% and 65% could be the same talent according to different assessors. The ambition tables already detailed (Expected years at college) suggest the likely pattern of events in any case. Because of the difficulty in manipulating two scores it was decided not to use the P scores but some analysis was made of the T scores of students from different firms.

T Scores : Carpentry and Joinery

The T scores for 10 of the large firms for carpenters and joiners were examined but there was no marked difference in score between the students of the different firms.

T Scores : Electrical Students

First Year Students

Firm 81 : Moderate spread of T scores (36% - 76%)
Average 57%

Firm 84 : Moderate spread (30% - 68%)
Average 52%

Firm 86 : Large spread (14% - 92%)
Average 52%

Firm 89 : Moderate spread (37% - 65%)
Average 55%

Other numbers were too small to be of service except that Firm 82 had a low average.

T Scores : Mechanical Students

Firm 87 : First three college years only represented. Low average T score, fairly wide spread (15%-80%)
Average 50%

Firm 90 : Good representation of older students. High average T score, fairly low spread (50% - 90%)
Average 68%

Firms 95, 97, 98, and 99 all fairly similar, although Firm 97 is somewhat better, about on a par with Firm 90. They had a medium spread with an average of 63% - 68% and the vast majority of scores between 60% and 80%.
Other numbers were too small.

APPENDIX 30

Job Wanted on Leaving School

The answers to thequestion "What kind of job did you want on leaving school?" are recorded in the following tables.

A) Carpenters and Joiners

Code (Job wanted on leaving school)

0 = Not recorded
1 = Carpenter or Joiner
2 = Other building trade
3 = Engineering apprenticeship
4 = Other apprenticeship (specified)
5 = Apprenticeship (unspecified)
6 = Other employment
7 = Undecided

Table 4

Falkirk Technical College			Code
Not recorded		3	0
Joiner	62		
Ship's Carpenter/Joiner	2	66	1
Cabinetmaker	1		
Carpenter	1		
Joiner or Painter	1		
Electrician or Joiner	1	8	2
Painter	1		
Electrician	5		
Motor Mechanic	6		
Engineer	1	10	3
Radio & TV Mechanic	1		
Draughtsman	2		
Cooper		1	4
Police Force		1	6
Undecided		1	7
Total		90	

Table 5

Stow College of Building, Glasgow			Code
Not recorded		4	0
Joiner		47	1
Electrician	3	4	2
Tile laying	1		
Motor Mechanic	11	25	3
TV Mechanic	2		
Engineering	1		
Mining Engineering	1		
Draughtsman	6		
Civil Engineer	1		
Elect. Engineer	1		
Toolmaker	1		
Toolsetter	1		
A trade		5	5
Explorer	1	9	6
Pilot	1		
Well paid good job	1		
Greenkeeper	1		
Merchant Navy Officer	1		
Marine Commando	1		
Cinema Projectionist	1		
Engine Driver	1		
Commercial Artist	1		
Undecided		1	7
Total		95	

Table 6

School of Building, Edinburgh			Code
Not recorded		6	0
Joiner		62	1
Electrician		6	2
Fitter	2	7	3
Draughtsman	3		
Surveyor or Draughtsman	1		
Agricultural Engineer	1		
Printer		2	4
Admiralty trade		1	5
Part-time Minister	1	10	6
Bookmaker	2		
R.M. Bandsman	1		
Hairdressing	2		
Police	1		
Fireman	1		
Lorry Driver	1		
Train Driver	1		
Undecided		1	7
Total		95	

Table 7

School of Building, Cambuslang			Code
Not recorded		2	0
Joiner		47	1
Electrician		5	2
Motor Mechanic	3		
Radio & TV Mechanic	2		
Toolmaker	1		
Engineer	2		
Draughtsman	3	14	3
Constructional Eng.	1		
Welding	1		
Wireless Operator	1		
Dancer	1		
Farmer	1		
Jockey	1		
Police	3		
Office Work	2		
Saesman	1		
Market Gardener	1	14	6
School Teacher	1		
Air Pilot	1		
Footballer	1		
R.A.F.	1		
Undecided		2	7
Total		84	

SUMMARY

Job Wanted on leaving School

Carpenters and Joiners

Area ↓ Code →	0	1	2	3	4	5	6	7
Falkirk	3	66	8	10	1	-	1	1
Glasgow	4	47	4	25	-	5	9	1
Edinburgh	6	62	6	7	2	1	10	1
Cambuslang	2	47	5	14	-	-	14	2
Total	15	222	23	56	3	6	34	5

Total 364

APPENDIX 30 (contd.)

B) Electrical Students

Code (Job wanted on leaving School)

0 = Not recorded
1 = Electrician
2 = Electrical Engineer (incl. Electronics Engineer)
3 = Engineer (unspecified)
4 = Draughtsman
5 = Radio & TV Engineer
6 = Motor Mechanic
7 = Other Engineering apprenticeship
8 = Other trade apprenticeship
9 = Other employment
10 = Undecided

Summary (447 Electrical Students)

Job wanted on leaving School

Centre ↓ Code →	0	1	2	3	4	5	6	7	8	9	10
Falkirk		15	1		1	1			3	2	
Esk Valley	4	39	20	2	3	3	5	3	2	11	1
Burnbank	2	47	15	2	7	1	3	6	8	2	1
Ramsay Tech.	9	72	11	4	1	6	3	5	11	12	4
Stow College	7	40	13	2	1	2	7	4	6	15	2
Total	22	213	60	10	13	13	18	18	30	42	8

C) Mechanical Students

Code (Job wanted on leaving School)

0 = Not recorded
1 = Engineering (unspecified)
2 = Electrical Engineering
3 = Electrician
4 = Draughtsman
5 = Radio & TV Mechanic
6 = Motor Mechanic
7 = Other Engineering apprenticeship
8 = Other trade apprenticeship
9 = Other employment
10 = Undecided

Summary (342 students)

Job wanted on leaving School

Centre / Code	0	1	2	3	4	5	6	7	8	9	10
Esk Valley	5	36	3	2	2	1	2	10	1	2	
Burnbank	4	26	2	4	8	2	1	27	2	14	
Ramsay Tech.	4	18	5	4	4	4	1	12	3	13	1
Stow College	4	36	6	4	15	3	9	19	6	16	1
Total	17	116	16	14	29	10	13	68	12	45	2

34 Royal Navy Artificer Apprentices

Job wanted on leaving School

Royal Navy	12
R.N. or M.N.	1
Aero/Marine/Mech.Engineer	7
Engineer (unspecified)	8
Apprenticeship (unspecified)	1
Travel	1
Fighter Pilot	1
Farmer	2
Undecided	1
Total	34

Number of Firms worked for since leaving School.

From the employment record since leaving school (many, especially mechanicals, left the details blank)an analysis of the number of firms worked for was made and is given below.

A) Carpenters and Joiners

No. of Firms Worked For

Stow College of Building	Av. No. of Firms worked for	Cambuslang School of Building	Av. No. of Firms worked for.
29 1stYr. Students	1.6(3-1)	25 1stYr.Stud.	1.6(4-1)
31 2nd Yr.	1.7(4-1)	20 2nd Yr.	1.0(2-1)
27 3rd Yr.	1.4(3-1)	22 3rd Yr.	1.5(4-1)
8 5th Yr.	1.4(2-1)	8 4th Yr.	1.0(2-1)
		8 4th Yr.	1.0(2-1)
		1 Full Tech. Cer.	7'

'including 5 times since completion of apprenticeship

Edinburgh School of Bldg.		Falkirk Tech. College	
59 1st Yr.	1.3(3-1)	11 1st Yr.	1.4(3-1)
25 2nd Yr.	1.6(4-1)	28 2nd Yr.	1.4(4-1)
11 4th Yr.	1.6(3-1)	35 3rd Yr.	1.2(3-1)

Note: The figures in brackets indicate thehighest and the lowest number of firms worked for by any student in the group. For example (3-1) means that 3 was the highest number of firms worked for and 1 the lowest number of firms worked for.

APPENDIX 31 (contd.)

B) Electrical Students

No. of Firms Worked for

Stow College of Engineering	Av. No. of Firms	Esk Valley College	Av. No. of Firms
43 1st Yr.	1.4(3-1)	13 1st Yr.(Mining)	1.3(3-1)
20 2nd Yr.	1.2(2.1)	25 2nd Yr.	1.6(3-1)
13 3rd Yr.	1.5(3-1)	19 3rd Yr.	1.3(5-1)
		9 4th Yr.	2.0(5-1)
		15 5th Yr.	1.7(4-1)
		10 O.N.C.	1.3(2-1)

Burnbank School of Engineering		Ramsay Tech. College	
52 1st Yr.	1.5(5-1)	92 1st Yr.	1.5(3-1)
21 2nd Yr.	1.2(3-1)	46 2nd Yr.	1.6(4-1)
21 3rd Yr.	1.5(3-1)		

C) Mechanical Students

No. ofFirms Worked for

Stow College of Engineering	Av. No. of Firms	Esk Valley College	Av. No. of Firms
9 1st Yr. (MECP)	1.9(3-1)	17 2nd Yr.(MECP)	1.2(2-1)
14 2nd Yr. (Full-time)	1.6(3-1)	7 3rd Yr.(MET)	1.0(1-1)
		6 3rd Yr.(Mining)	1.5(3-1)
23 4th Yr. (MET)	1.2(2-1)	3 O.N.C.(Mining)	2.3(4-1)
27 5th Yr.(MSE)	1.3(3-1)	10 ONC(Straight Mech.)	1.9(5-1)
13 HNC (Production)	1.3(3-1)		

Burnbank School of Engineering		Ramsay Technical College	
11 4th Yr.(MECP)	1.0(2-1)	12 1st Yr.(MET)	1.0(2-1)
13 02 (Production)	1.1(2-1)	12 2nd Yr.(MECP)	1.2(2-1)
2 5th Yr.(MSE)	1.0(1-1)	13 2nd Yr.(MET)	1.3(3-1)
		10 3rd Yr.(MECP)	1.4(3-1)

Reason for leaving Job

From the employment record since leaving school an analysis was also made of the reasons given for leaving each job. The results are given below, showing each area separately and keeping close to the actual terminology used by the students; this means some duplication of the same reason in different words. The final summary for each of the three skills (carpentry and joinery, electrical, mechanical) groups the reasons more rationally.

A) 116 Carpenters and Joiners

Reason given for leaving Job (s)

Glasgow

1)	No future	8
1)	Better Job	9
1)	More, not enough experience	2
2)	To start trade	12
3)	Unsuitable	3
3)	Too far to travel	1
3)	Hours	1
3)	Another job	2
3)	Not healthy	1
4)	Paid off	3
5)	Bankrupt	1
6)	Money	2
7)	Moved	2
	Total	47

Cambuslang

1)	No prospects	7
1)	Served time as joiner	1
1)	For more experience	4
2)	To start trade	8
3)	Did not like	2
3)	Another job	1
3)	The hours	1
4)	Paid off	5
5)	Bankrupt	5
6)	No money	1
7)	Came back to Scotland	1
9)	Just left	3
	Total	39

Falkirk

1)	No prospects	7
1)	Back to joinery	1
1)	Not enough experience	1
2)	To start app/ship	3
3)	Not what expected	1
3)	Did not like	3
3)	Did not like shift work	2
3)	Saturday work	1
4)	Paid off	1
6)	More money	2
10)	Accident	1
	Total	23

Edinburgh

1)	No prospects	9
1)	For more experience	1
2)	To start app/ship	9
3)	Did not like firm	1
3)	Another job	3
3)	Not interesting	1
3)	Unsuitable	2
3)	Hours	1
4)	Redundant, paid off	2
5)	Bankrupt	3
6)	Money	1
7)	Changed address	1
8)	Transfer by Union	4
9)	None	1
	Total	39

APPENDIX 32 (contd.)

Summary

116 Carpenters and Joiners

Reason given for leaving Job(s)

1)	Prospects, experience, better job	50
2)	To start apprenticeship/trade	32
3)	Unsuitable, did not like, too far to travel etc.	27
4)	Redundant/paid off	11
5)	Bankrupt	9
6)	Money/Wages	6
7)	Moved	4
8)	Transfer by union	4
9)	No reason	4
10)	Accident	1
	Total	148

B) 153 Electrical Students

Reason given for leaving job(s)

Hamilton

1)	No prospects	6
1)	Better job	6
1)	Not enough experience	2
2)	Apprenticeship	6
3)	New job	1
3)	Did notlike	1
4)	Redundant	6
4)	Lack of work	3
4)	Paid off	4
6)	More money	2
	Did not get on with mate	1
	Finished year's course	1
	Total	39

Falkirk

1)	Better job	9
1)	Dead end	2
1)	Further Education	1
2)	To start app/ship	12
3)	Dislike	5
3)	Too dirty	1
3)	New job	2
4)	Paid off	2
4)	Redundant	5
	Total	39

B) 153 Electrical Students (contd.)

Dalkeith

1) Better prospects/job	6
1) No day release	1
1) More experience	3
1) No prospects	6
1) Dying trade	1
1) Unable to gain qualifications	1
2) Wanted apprenticeship	5
3) Did not like	6
3) Saturday afternoons	1
3) New job	2
3) Wanted to change	2
3) To be nearer home	2
3) Domestic	3
3) Travelling, etc.	2
4) Redundant	1
4) End of contract	1
6) Money	7
Joined R.N.	1
Assaulted employee	1
Total	52

Portobello

1) No prospects	3
1) Dead end	2
1) Better job	13
1) No experience	3
2) To start app/ship	11
3) Did not like	9
3) Another job	10
4) Paid off	1
4) Bought over	1
4) Lack of work	3
5) Bankrupt	6
6) Money/Higher wage	2
7) Moving house	1
Disagreement with employer	1
Joined Navy	1
Total	67

Summary

153 Electrical Students

Reason given for leaving Job(s)

1) Prospects, experience, better job, etc.	65
2) To start apprenticeship/trade	34
3) Unsuitable, did not like, too far to travel etc.	47
4) Redundant, paid off, etc.	27
5) Bankrupt	6
6) Money/Wages	11
7) Moved	1
Others	6
Total	197

APPENDIX 32 (contd.)

C) 63 Mechanical Students

Reason given for leaving Job(s)

Glasgow

1)	No prospects	6
1)	Better job	5
1)	To gain experience	1
2)	Apprenticeship	10
3)	Unsatisfied	1
3)	Another job	2
4)	Paid off	2
5)	Firm went into liquidation	1
6)	Money	2
	Total	30

Portobello

1)	No future	1
1)	To join Ferranti's	2
1)	Better job	3
2)	Wanted trade	1
3)	Did not like	2
3)	Didn't like boss	1
3)	Left for next job	1
5)	Bankrupt	1
	Total	12

Dalkeith

1)	Better job	1
1)	More experience	1
1)	Further education	1
3)	Distance	2
3)	Shore employment	1
3)	Fed up	1
3)	Not my type of work	1
4)	Firm taken over	2
4)	Redundant	1
4)	Short time	1
6)	Wages	3
7)	Shift to another area	1
	Disagreement with manager	1
	Total	17

Hamilton

1)	Waiting for vacancy	1
1)	Better prospects	1
1)	Lack of experience	1
1)	Training completed	1
2)	Starting app/ship	1
3)	Not satisfied	3
4)	Redundancy, closed down	3
	Total	11

SUMMARY

63 Mechanical Students

Reason given for leaving Job(s)

1)	Prospects, experience, better job, etc.	25
2)	To start apprenticeship/trade	12
3)	Unsuitable, did not like, too far to travel, etc.	15
4)	Redundant, paid off, etc.	9
5)	Bankrupt	2
6)	Money/Wages	5
7)	Moved	1
	Others	1
	Total	70

APPENDIX 33

How did you obtain your apprenticeship?

The answers to the above question are tabulated below.

A) Carpenters and Joiners

Code:
- 0 = Unrecorded
- 1 = Own Initiative
- 2 = Friend or relative
- 3 = Employer's initiative
- 4 = Youth Employment Officer
- 5 = Answered advertisement
- 6 = Written application
- 7 = School Teacher
- 8 = School of Building

	Falkirk	Cambuslang	Edinburgh	Glasgow	Total
0		2	1	2	5
1	37	27	30	26	120
2	27	27	33	37	124
3	10	13	8	10	41
4	10	7	5	12	34
5		4	3	4	11
6	4		2	3	9
7	2	3	5	1	11
8		1	7		8
Total	90	84	94	95	362

B) Electrical Students

Code: As for Carpenters and Joiners except 8 = School of Engineering

	Dalkeith	Hamilton	Portobello	Glasgow	Falkirk	Total
0	2	4	1	5		12
1	30	35	56	33	3	157
2	4	23	30	29	3	89
3	4	16	19	11	1	51
4	10	12	14	13	9	58
5	41	1	9	1	5	57
6		1	1		1	3
7	1	2	7	4	1	15
8	1		1	3		5
Total	93	94	138	99	23	447

C) Mechanical Students

Code: As for Electricals

	Dalkeith	Hamilton	Portobello	Glasgow	Total
0	1	52*	7	3	63
1	28	13	36	58	135
2	5	2	3	19	29
3	3	4	3	3	13
4	2	9	5	12	28
5	17	3	8	13	41
6		4	1	5	10
7	4	3	6	6	19
8	4				4
Total	64	90	69	119	342

* Misdirection by teacher

APPENDIX 33 (contd.)

34 Royal Navy Artificer Apprentices

0	-
1	14
2	4
3	1
4	1
5	9
6	-
7	5
8	-
Total	34

How Employed

The analysis of the students' answers to the question as to how they were employed is detailed below.

A) Carpenters and Joiners

How Employed

	Cambuslang	Edinburgh	Falkirk	Glasgow	Total
General Building	64	69	55	69	257
Maintenance	10	4	17	14	45
Jobbing	5	6	8	7	26
Shop Fitting	5	6	-	3	14
Shop Work	-	-	3	-	3
Ship's Joiner	-	-	3	-	3
Machine Work	-	-	3	-	3
Concrete Shuttering	-	1	-	-	1
Pre-Cast Concrete Formwork	-	-	1	-	1
Display Joinery	-	-	-	1	1
Others	-	8	-	1	9
Total	84	94	90	95	363

B) Electrical Students

How Employed

	Dalkeith	Hamilton	Portobello	Glasgow	Falkirk	Total
Mining	93	-	-	-	-	93
Maintenance	-	57	40	31	14	142
Contracting Installation Construction	-	37	81	64	8	190
Elect.Fitting	-	-	17	-	1	18
Shipbuilding	-	-	-	4	-	4
Total	93	94	138	99	23	447

APPENDIX 34 (contd.)

C) Mechanical Students

How Employed

	Dalkeith	Hamilton	Portobello	Glasgow	Total
Not recorded	-	2	-	2	4
Production	25	72	44	74	215
Maintenance	39	12	4	26	81
Research & Development	-	3	4	2	9
Pre-Apprentice	-	1	15	-	16
Training School/Centre	-	-	2	14	16
Others	-	-	-	1	1
Total	64	90	69	119	342

APPENDIX 35

ACTIVITY ANALYSIS: OPERATIONS PERFORMED BY JOINERS AND APPRENTICES 7.1.63 TO 31.3.63

NAMES	NUMBER OF OPERATOR	NOTE FOR KEY TO OPERATIONS SEE APPENDIX 12																											
J. Moir c/h	1	A	F	A	A	G	C	F	C	G	R	F	C	C	G	A	G	F	C	B	C	B	C	C	F	F	A	B	D
T. Smith App	2	A	F	A	G	G	C	C	C	G	R	G	D	Y	R	B	G	G	D	D	C	G	C	C	P	G	Y	B	W
J. Heron	3	B	B	B	A	C	E	A	A	B	C	B	B	R	D	B	A	B	B	D	B	P	B	Z	A	A	D	A	F
W. Jeffrey App	4	D	A	B	A	D	D	A	A	A	A	B	Y	B	A	D	B	B	B	A	G	A	V	V	F	Z	Z	A	E
P. Hunter	5	A	A	A	A	A	A	A	B	C	A	S	A	F	A	A	A	A	F	B	F	J	B	A	A	A	D	A	D
T. Archibald	6	A	A	D	D	D	D	C	B	C	D	D	E	N	A	D	D	D	F	B	A	J	B	A	W	W	W	A	Z
F. Bain	7	A	N	C	A	Z	B	A	B	A	A	F	C	D	F	D	A	B	D	A	D	B	A	A	G	H	B	A	F
J. Somerville App	8	D	N	A	G	Y	B	A	B	A	R	W	W	W	W	W	W	F	A	A	B	B	V	V	Z	H	H	H	V
A. Lamb c/h	9	A	F	A	F	A	F	F	A	F	A	H	H	G	F	A	A	D	F	B	A	A	F	H	U	O	F	F	O
J. Sutherland	0	A	A	U	F	A	A	F	A	A	A	D	M	D	F	A	A	D	C	C	C	D	F	H					
J. Duncan	11	A	A	A	A	H	F	H	H	H	H	A	E	A	F	A	D	F	E	D	D	L	H	H	A	A	A	F	O
R. Tumblty	12	A	A	A	A	H	F	H	H	H	H	Z	F	B	B	A	A	M	B	B	B	L	H	H	A	A	A	F	A
J. Tait	13	A	F	A	A	A	A	A	N	A	A	D	F	A	B	A	B	M	F	B	B	N	F	H					
T. MacAlpine	14	A	F	A	A	A	A	A	N	A	A	W	W	W	W	W	W	C	F	B	D	N	F	H					
S. Morgan App.	15	A	A	A	G	A	Y	A	G	D	A	A	F	A	A	A	B	C	F	B	Q	F	F	H	K	K	A	A	G
J. S. McKenzie c/h	16	A	C	A	A	A	A	A	A	A	A	G	A	B	A	A	F	A	A	A	D	F	B	A	A	H	A	A	A
A. Lamond	17	A	A	A	A	A	A	A	A	A	J	A	A	B	D	A	F	A	A	A	A	A	H	H	A	H	A	F	A
J. Bishop	18	A	A	D	A	A	J	G	F	A	A	A	A	A	U	A	A	A	F	A	A	A	A	A	A	H	A	F	A
A. Hastie	19	A	A	A	A	F	A	A	A	A	G	M	A	D	A	A	J	Y	F	D	D	F	H	H	A	H	A	A	A
T. Dick c/h	20	A	F	J	F	A	A	F	A	A	F	G	A	F	X	A	J	A	A	A	Z	A	A	F	B	B	A	A	N
T. MacKay	21	A	A	F	A	A	J	A	A	A	M	J	A	F	A	F	A	A	A	A	F	A	A	F					
G. Skene	22	H	D	H	F	H	A	A	A	F	J	B	S	D	D	D	A	A	G	G	D	J	A	A	G	Z	N	A	A
L. Orde	23	H	C	J	F	H	A	A	A	F	J	A	S	B	B	A	A	D	A	A	G	Z	A	A	B	B	N	A	A
G. Brown	24	A	A	J	F	A	A	G	A	G	F	A	Y	B	B	A	A	F	A	A	S	A	A	G					
W. Rogers c/h	25	K	A	A	A	A	A	A	G	A	A	X	X	F	F	X	F	G	G	B	B	G	A	A	W	X	F	R	A
J. Yorke	26	K	A	A	J	A	F	A	A	A	A	F	B	A	F	A	F	D	H	H	H	H	A	A	B	Z	H	A	A
D. Hastie	27	K	A	K	K	A	F	A	A	A	A	H	B	A	A	A	F	A	A	A	A	K	K	K	B	Z	H	A	A
R. McKenzie	28	A	A	K	K	A	F	A	A	A	A	H	B	A	A	A	O	A	A	A	A	K	A	A					
P. Hill c/h	29	A	A	F	H	H	F	H	H	K	H	G	G	O	K	K	F	A	A	A	A	A	A	B	U	A	A	A	A
W. Peacock	30	A	A	A	F	H	H	F	H	H	J	K	K	K	J	O	J	F	A	A	A	A	T	T	A	A	F	F	O
J. Hogg	31	K	K	K	J	D	J	F	A	A	A	A	T	T	A	A	A	F	B	W	W	W	W	A	A	F	N	A	A
J. Campbell App.	32	V	V	V	V	A	A	F	N	A	A	K	G	K	J	G	J	A	J	J	G	A	A	H	A	A	N	F	O
G. Palmer c/h	33	Z	L	F	A	A	D	D	A	A	A	G	A	G	D	B	A	G	A	F	A	F	D	J					
J. Brownhill	34	Q	A	A	J	A	F	A	A	C	J	Y	L	F	A	B	B	G	A	F	F	G	A	A					
G. Hogg	35	B	A	D	A	Z	B	B	B	D	D	A	L	A	G	A	A	Z	B	A	A	A	A	A	B	A	A	B	O
E. Callow	36	C	A	Q	A	Z	B	B	B	D	D	A	L	A	D	A	A	P	A	A	A	A	A	A	D	D	A	B	O
T. Willens	37	U	A	A	A	A	A	B	A	F	A	A	L	C	A	F	A	H	A	A	A	O	D	F	A	A	A	A	A
G. Melrose	38	A	L	C	C	F	D	G	P	U	A	A	D	A	D	A	A	D	A	D	A	D	F	A	A	B	A	F	A
J. Docherty	39	Q	D	A	F	A	G	A	A	A	A	A	L	A	O	M	D	B	B	A	A	A	A	B					
J. Playfair App	40	U	P	G	G	L	A	A	G	A	A	A	L	G	G	M	M	M	G	L	G	O	A	A					
W. Bruce App	41	V	V	V	V	A	A	A	G	A	J	A	L	P	G	M	M	B	L	G	O	M	G	L	Y	Y	D	D	V
E. Campbell	42																								K	K	N	D	B

Appendix 36 : Activity Analysis : Operations Performed by Apprentices

7.1.63 to 31.3.63

NUMBER OF OPERATION **Note** For Key See Appendix 37

Names.	Number of Operator																						
T. Smith	2	1	6	1	7	7	3	3	3	7	17	7	4	23	17	2	7	7	4	4	3	7	3
W. Jeffrey	4	4	1	2	1	4	4	1	1	1	1	2	23	2	1	4	2	2	2	1	7	1	21
J. Somerville	8	4	13	1	7	23	2	1	2	1	17	22	22	22	22	22	22	6	1	1	2	2	21
S. Morgan	15	1	1	1	7	1	23	1	7	4	1	1	6	1	1	1	2	3	6	2	16	6	6
J. Campbell	32	21	21	21	21	1	1	6	13	1	1	10	7	10	9	7	9	1	9	9	7	1	1
J. Playfair	40	20	15	7	7	11	1	1	7	1	1	1	11	7	7	12	12	12	7	11	7	14	1
W. Bruce	41	21	21	21	21	1	1	7	1	9	1	11	15	7	12	12	2	11	11	7	14	12	1

Names.																						
T. Smith	24	13	24	24	24	24	24	13	7	14	4	4	3	4	1	1	1	12	6	14	1	1
W. Jeffrey	1	4	13	6	1	1	24	24	6	24	6	23	23	2	2	1	7	2	5	6	14	4
J. Somerville	22	22	22	22	22	22	22	22	1	1	1	4	7	2	6	22	22	22	22	22	22	22
S. Morgan	12	2	1	6	6	13	7	7	7	6	7	6	1	23	3	13	2	2	6	13	7	2
J. Campbell	23	23	19	19	23	19	6	17	12	23	23	7	14	23	23	2	2	7	2	7	1	1
J. Playfair	1	1	7	7	1	1	23	7	7	1	1	1	7	1	6	1	7	1	14	23	1	2
W. Bruce	23	23	5	1	7	7	4	1	14	1	1	1	13	6	2	1	7	1	7	14	13	14

2	3	15	7	23	2	22	7	7	14	1	1	2	1	6	1	18	6	24	24	24	24	24
4	21	6	25	25	1	5	7	7	23	14	1	1	7	7	6	7	23	23	3	23	23	7
8	21	25	1	29	29	21	14	14	7	1	7	4	7	18	18	18	6	13	6	22	22	22
15	8	10	10	1	1	7	7	2	6	1	1	2	1	1	1	3	23	3	13	27	13	12
32	8	1	1	13	6	14	23	23	2	7	7	9	14	1	6	14	10	23	19	19	23	2
40	1	22	22	22	22	1	23	2	1	2	1	1	4	6	1	5	7	1	1	27	27	27
41	23	23	4	4	21	2	1	1	2	4	23	7	7	7	14	1	1	27	27	27	7	4

2	1	6	6	12	6	7	7	7	1	12	9	7	7	4	4	2	4	6	9	2		
4	4	9	3	2	2	3	1	6	1	2	4	21	21	21	21	21	21	21	21	21		
8	22	22	7	7	6	7	7	1	1	4	2	21	21	21	21	21	21	21	21	21		
15	2	2	7	6	9	7	2	1	1	2	7	7	7	6	6	14	26	26	14	26		
32	1	7	7	7	14	2	1	7	6	1	7	7	1	1	1	2	7	2	7	2		
40	7	7	28	28	13	23	23	1	1	7	23	13	14	14	23	4	7	1	4	2		
41	2	13	25	25	25	25	25	2	2	1	6	6	7	7	7	14	14	6	14	9		

APPENDIX 37 : ACTIVITY ANALYSIS : DETAILS OF OPERATIONS IN APPENDIX 36

KEY TO APPENDIX 36		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
NAMES	NUMBER OF OPERATOR	FIXING OR ERECTING MATERIAL	POSITION AND/OR PLUMB MATERIAL	MEASURE MATERIAL OR POSN. OF SAME	CUT MATERIAL	MARK MATERIAL	TALKING ABOUT THE JOB	ABSENT FROM JOB POSITION	PREFABRICATE SHUTTERS	COLLECT TOOLS, TIDY-UP ETC.	STRIP SHUTTERS	LIGHT AND/OR STAND AT FIRE	LOOK FOR AND COLLECT MATERIAL	MOVE TO NEXT JOB	MOVE MATERIAL	WALKING
T. SMITH	2	13	5	7	9		8	16		2			3	3	3	
W. JEFFREY	4	18	12	3	8	2	7	8		1				1	2	
J. SOMERVILLE	8	12	6		4		5	9						2	2	
S. MORGAN	15	21	12	4	1		13	14	1	1	2		2	5	2	
J. CAMPBELL	32	18	9				5	16	1	5	3		1	2	5	
J. PLAYFAIR	40	28	4		3	1	2	18				3	3	2	4	1
W. BRUCE	41	17	7		5	1	4	14		2		3	3	3	8	1
	TOTALS	128	55	14	30	4	44	95	2	11	5	6	12	18	26	2

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	
NUMBER OF OPERATOR	HOLD MATERIAL BEING CUT	LOAD AND UNLOAD MATERIAL	WAIT INSTRUCTIONS	WAIT CRANE	SMOKING	DAY RELEASE	OFF WORK	WATCH TRADESMAN	REMOVE TEMPORARY WORK	DOOK WALL	CLEAN MATERIAL	SHELTER FROM RAIN	CLEAN OFF PUTTY	PREFAB PARTITIONS	TOTALS
2		2	1				1	2	11						86
4						11		8	3	2					86
8		1	3			12	26	1		1				2	86
15	1							3			3	1			86
32		1		5		4		11							86
40					1		4	7				3	2		86
41						5		5		5		3			86
TOTALS	1	4	4	5	1	32	31	37	14	8	3	7	2	2	602

APPENDIX 38 : ACTIVITY ANALYSIS : ESTIMATED PERCENTAGE OF TIME ON ALL ACTIVITIES, JOINERS AND APPRENTICES.
ASSUME ACCURACY ± 2%

ACTIVITY	NUMBER OF OBSERVATIONS	ESTIMATED PERCENTAGE OF TOTAL TIME	95% CONFIDENCE LIMITS AS A PERCENTAGE OF TOTAL TIME
FIXING OR ERECTING MATERIAL	462	41·9 %	± 2·96
POSITION AND/OR PLUMB MATERIAL	95	8·6 %	± 1·68
MEASURE MATERIAL OR POSITION OF SAME	33	3·0 %	± 1·02
CUT MATERIAL	73	6·62 %	± 1·50
MARK MATERIAL	4	0·36 %	± 0·36
TALK ABOUT THE JOB	116	10·52 %	± 1·82
ABSENT FROM JOB POSITION	57	5·17 %	± 1·32
PREFABRICATE SHUTTERS	56	5·08 %	± 1·32
COLLECT TOOLS TIDY-UP ETC.	27	2·45 %	± 0·92
STRIP SHUTTERS	26	2·35 %	± 0·90
LIGHT AND/OR STAND AT FIRE	15	1·36 %	± 0·69
LOOK FOR AND COLLECT MATERIAL	12	1·09 %	± 0·62
MOVE TO NEXT JOB	14	1·27 %	± 0·66
MOVE MATERIAL	15	1·36 %	± 0·69
WALKING	6	0·54 %	± 0·11
HOLD MATERIAL BEING CUT	5	0·46 %	± 0·40
LOAD AND UNLOAD MATERIAL	6	0·54 %	± 0·11
WAIT ON OR TO CUT MATERIAL	4	0·36 %	± 0·36
REPAIR SHUTTERS	4	0·36 %	± 0·36
SMOKING	7	0·63 %	± 0·48
DAY RELEASE	14	1·27 %	± 0·66
OFF WORK	21	1·9 %	± 0·82
SUPERVISE AND INSPECT	5	0·46 %	± 0·40
WATCH TRADESMAN OR LABOURER	10	0·9 %	± 0·56
MISCELLANEOUS *	16	1·45 %	± 0·72
TOTALS	1103	100 %	

* SEE APPENDIX 12

Appendix 39 : Activity Analysis : Estimated Percentage of Time on All Activities. Apprentices

Activity	Number of Observations	Estimated Percentage of Total Time	95% Confidence Limits as a Percentage of Total Time
Fixing or Erecting Material	128	21.0 %	± 3.28
Position and/or Plumb Material	55	9.15 %	± 2.34
Measure Material or Position of Same	14	2.3 %	± 1.2
Cut Material	30	5.0 %	± 1.76
Mark Material	4	0.7 %	± 0.66
Talk About The Job	44	7.3 %	± 2.08
Absent From Job Position	95	15.85 %	± 2.97
Prefabricate Shutters	2	0.3 %	± 0.44
Collect Tools Tidy-Up Etc.	11	1.85 %	± 1.07
Strip Shutters	5	0.85 %	± 0.72
Light and/or Stand at Fire	6	1.0 %	± 0.8
Look for and Collect Material	12	2.0 %	± 1.13
Move to Next Job	18	3.0 %	± 1.38
Move Material	26	4.3 %	± 1.65
Walking	2	0.3 %	± 0.44
Hold Material Being Cut	1	0.15 %	± 0.22
Load and Unload Material	4	0.7 %	± 0.66
Wait Instructions	4	0.7 %	± 0.66
Smoking	1	0.15%	± 0.24
Day Release	32	5.3 %	± 1.82
Off Work	31	5.25%	± 1.8
Watch Tradesman	37	6.15%	± 1.94
Remove Temporary Work	14	2.3 %	± 1.2
Shelter from. Rain	7	1.15%	± 0.84
Prefabricate Partitions	2	0.3 %	± 0.44
Wait Crane	5	0.85 %	± 0.72
Miscellaneous *	13	2.1 %	± 1.16
* Door Wall 8 Clean Material 3 Clean Off Putty 2 13	602	100.0 %	Totals

APPENDIX 40

BUILDING CLASSIFICATIONS

I **Building Types according to their social / community / town-planning Function**

List A

Factories, Industrial Buildings and Warehouses; Commercial Buildings (offices, shops, rest~~/~~aurants, banks).

Vehicles (caravans, coach-building, ships, rolling stock)

Dwellings (houses, flats, provision of standard amenities)

Educational Buildings (schools, colleges, universities, residential centres, churches, etc.)

Hospitals

Sundries (petrol filling stations, temporary constructions, lock-up garages)

Alternative List A

Low-rise Residential

Multi-storey Residential

Residential Health

Non-residential : schools, recreation

Colleges, Laboratories, etc.

Offices,

Public, Municipal, Cultural

Commercial

Industrial

II/

II Building Classification by the Form of Structure

List B

Load-bearing brickwork with :	structural timber and / or pre-cast concrete
In situ reinforced concrete :	with brick infill
or steel frame	and / or timber (or like) cladding infill
or pre-cast concrete frame	and / or precast concrete

Rationalised traditional

Industrialised system, being steel, timber or concrete framed, load-bearing timber or concrete panel or in-situ concrete.

III Building Classification on the Basis of the actual Carpentry Work involved, under broad Headings

List C

1st Fix	Shorting
2nd Fix	Partitions
Shuttering	Fences
External frames and cladding	Timber floors
Timber carcassing	Temporary timber huts
Joiner's shopwork	Glazing
Cabinet-making	etc.

Note : Repairs and maintenance, and restoration, fall into the appropriate category in the lists.

APPENDIX 41

Subject Ratings : 34 Part-time Students

Subject	A	B	C	D	E
Building Technology	27	5	2	-	-
Quantity Surveying	12	14	2	4	2
Structural Design	10	13	4	5	2
Building Science	8	8	11	6	1
Estimating for Builder Work	9	12	4	4	5
Supervising and Specification	8	9	7	7	3
Building Geometry	10	6	8	8	2
Mathematics	13	13	5	2	1

A = Very Useful

B = Useful

C = Of average assistance

D = Not very useful

E = Of no use at all

Age : 34 Part-time Students

including a) craftsmen who had served an apprenticeship

b) non-craftsmen with generally a longer schooling and a more technical background.

Craftsmen						Non-Craftsmen					
Age Group						Age Group					
20-25	25-30	30-35	35-40	40-45	Total	20-25	25-30	30-35	35-40	40-45	Total
8	6	3	3	1	21	10	3	0	0	0	13
Craft Trained				61.8%		Non-Craft trained				38.2%	

APPENDIX 41 (continued)

Age on obtaining H.N.C. - 34 Part-time Students

Age	20	21	22	23	24	25	26	27	28	29	30	32	35	36	38	41	Total
No. of Students.	4	2	4	6	2	1	5	1	1	1	2	1	1	1	1	1	34

Age : 40 Full-time Students

Craftsmen				Non-Craftsmen			
Age Group				Age Group			
20-25	25-30	30-35	Total	20-25	25-30	30-35	Total
8	8	4	20	18	2	0	20
Craft Trained			50%	Non-Craft Trained			50%

Age on obtaining Higher National Diploma or Associateship - 40 Full-time Students

Age	20	21	22	23	24	25	26	28	29	30	31	32	33	34	Total
No. of Students	2	3	2	7	8	4	3	3	2	2	1	1	1	1	40

APPENDIX 41 (continued)

No. of firms worked for since leaving school : 34 Part-time Students

The average number of jobs per man over an average of 14 years was 3.8. Each man spent an average of 3.7 years with each firm.

No. of firms worked for between leaving school and starting full-time studies at the Heriot-Watt University : 40 Full-time Students

The average number of jobs per student (including those coming straight from school) was 1.55 over an average period of 5.8 years, i.e. an average period of 3.74 years in each job.

No. of firms worked for after leaving Heriot-Watt University : 40 Full-time Students

The average number of jobs was 1.92 over an average period of 5.06 years. i.e. average period in each job = 2.64 years.

Reason for leaving job : 34 Part-time Students

Reason for leaving	No. of times given
To gain experience	19
To gain financially	15
Higher Position	9
Dissatisfaction with conditions	9
To start own business	1
Liquidation of company	2
Travelling difficulties	1
Illness	1
To or from full-time study	21
To or from National Service	22

APPENDIX 41 (continued)

Reason for leaving job*: 40 Full-time Students

Reason for leaving	No. of times given
To gain experience	9
To gain financially	1
Better job	6
Dissatisfied with conditions	2
Illness	4
To or from full-time study	30
To or from National Service	10
Lack of work	1
Failed 1st Year Teachers' Course	1

*between leaving school and starting full-time studies at Heriot-Watt University.

Reason for /

APPENDIX 41 (continued)

Reason for leaving post-graduate Job : 40 Full-time Students

Reason for Leaving	No. of times given
To gain experience	4
To gain financially	3
To gain financially and also experience	2
To gain financially also housing difficulty	1
To gain higher position	5
Work too monotonous and the firm did not use my capabilities	2
Dissatisfied with conditions	1
For better prospects	1
Travelling difficulties	1
Wanted to return to Edinburgh	1
To get the chance of further qualifications	1
To take up teaching	1
This was only a temporary job	1
Personal reasons	1
Domestic reasons	1
To and from National Service	3
To and from full-time study	2
Lack of security and home life was upset by being very mobile, also the wages paid did not compensate for these difficulties.	1
No comment	8

APPENDIX 41 (continued)

Posts occupied by 34 part-time students immediately before and after gaining the Higher National Certificate

Student	Age	Before	After
1	25	Quantity Surveyor	Quantity Surveyor
2	27	Joiner	Assistant Planning Engineer
3	33	Joiner	Clerk of Work
4	29	Draughtsman	Shopfitting Designer
5	28	Joiner	Joiner
6	26	Mason	Teacher
7	37	Joiner	Property Maintenance Assistant
8	26	Slater	General Foreman
9	25	Draughtsman	Site Agent
10	34	Joiner	Teacher
11	21	Draughtsman	Architectural Assistant
12	26	Joiner	Sub-agent
13	31	Cabinet Maker	Teacher
14	29	Joiner	Teacher
15	28	Tracer	Senior Tracer
16	21	Draughtsman	Draughtsman
17	46	Plasterer	Inspector of Works
18	43	Joiner	Teacher
19	43	Joiner	Teacher
20	21	Draughtsman	Architectural Assistant
21	34	Joiner	Quantity Surveyor
22	29	Draughtsman	Senior Architectural Assistant
23	23	Land Surveying Assistant	Land Surveyor and Draughtsman

table continued.

APPENDIX 41 (continued)

Student	Age	Before	After
24	26	Quantity Surveyor	Site Agent
25	28	Draughtsman	Full-time Study
26	33	Joiner	Teacher
27	29	Joiner	Teacher
28	33	Plasterer	Site Foreman
29	25	Draughtsman	Draughtsman
30	24	Joiner	Assistant Surveyor
31	25	Joiner	Sub-Agent
32	33	Joiner	Teacher
33	27	Assistant Quantity Surveyor	Quantity Surveyor
34	29	Joiner	Section Foreman

Posts occupied by 40 students immediately before and after full-time study

Student	Age	Before	After
1	31	Joiner	Technical Assistant (Arch.)
2	30	National Service	Contracts Manager
3	25	Draughtsman	Sub-Agent
4	29	Straight from school	Planning Assistant
5	21	Straight from school	Quantity Surveyor
6	28	Surveyor / Clerk	Quantity Surveyor and Estimator
7	22	Straight from school	Quantity Surveyor
8	33	Stonemason	Teacher
9	38	Slater / Roughcaster	Regional Technical Manager
10	28	Joiner	Quantity Surveyor
11	39	Joiner	Senior Building Foreman
12	34	Joiner	Teacher
13	24	Joiner	Architectural Assistant
14	41	Clerk	Quantity Surveyor
15	26	Building Surveyor	Senior Engineering Assistant
16	22	Straight from school	Still studying
contd.			

APPENDIX 41 (continued)

Student	Age	Before	After
17	21	Apprentice Quantity Surveyor	Still studying
18	24	Draughtsman	Still studying
19	26	Draughtsman	Teacher
20	26	Draughtsman	Technical Assistant (Arch.)
21	28	Straight from school	Site Engineer
22	32	Joiner	Site Agent
23	38	Plasterer	Senior Quantity Surveyor
24	27	Joiner	Still Studying
25	35	National Service	Quantity Surveyor
26	28	Plumber	Planning Engineer
27	28	Draughtsman	Planning Engineer
28	37	Joiner	Contracts Manager
29	38	Plumber	Teacher
30	32	Straight from school	Senior Quantity Surveyor & Depute Contracts Manager
31	33	Joiner	Town Planning Inspector
32	26	Joiner	Joined family joiner's business
33	26	Straight from school	Planning Designer
34	26	Joiner	Production Controller
35	32	Plumber	Teacher
36	28	Joiner	Teacher
37	27	Sanitary Inspector	County Master of Works
38	25	Plasterer	Sub-agent
39	29	Joiner	Still studying
40	31	Straight from school	Building Manager

contd.

APPENDIX 41 (continued)

How did you obtain your present post? : 40 Full-time Students

Applied on own initiative	18
Answered advertisement	8
College Appointments Service	2
Through a friend	2
Through College official	2
Served apprenticeship with this firm	1
Joined family business	1
Still studying full-time	5
No answer	1
Total	40

Posts/

What type of job did you want on leaving College? : 40 Full-time Students

Building Management / Building or Civil Engineering Site Work	10
Quantity Surveyor	6
Teaching	5
Good Experience	5
Joined family business or set up own business	2
Building Surveyor	1
Building Research	1
Planning Engineer	1
Architectural Assistant	1
Experience in Contracts	1
No idea	7
Total	40

How did you obtain your present post? : 34 Part-time Students

Self-employed	1
Approached by employer	6
Applied on own initiative	21
Through a friend	3
Through a relative	1
Through the Institute of Clerk of Works	1
No reply	1
Total	34

APPENDIX 42

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A P P E N D I X 43

The National Plan, September, 1965

Foreword by the First Secretary of State

The publication by the Government of a plan covering all aspects of the country's economic development for the next five years is a major advance in economic policy-making in the United Kingdom. Prepared in the fullest consultation with industry, the plan for the first time represents a statement of Government policy and a commitment to action by the Government.

The most serious economic problem facing us at the present time is the balance of payments. We have to eliminate the deficit and repay the debts incurred in financing past deficits. This must be regarded as a first priority in any programme for greater economic growth. We shall only get the exports which we need to do this by becoming more efficient and competitive. The plan sets out the policies and the actions needed to achieve these ends. Increasing our output by 25 per cent may seem an ambitious aim at a time when balance of payments considerations limit the short run possibilities for expansion. But in reality the immediate situation makes it essential that industry must plan its investment, manning and training in order to achieve this result. If industry is to do this, it must have a clear picture of the potential growth of the economy four or five years ahead: this the Plan provides.

Only in this way can Britain break out of the vicious circle of balance of payments difficulties and restriction of output that keep plaguing us.

The/

Appendix 43 (contd.)

The plan is a guide to action. Some things have been done already, but a lot still has to be done. The Government is discussing with industry the measures needed to implement the plan. Leaders in management and the trade unions have a special responsibility, but it cannot be left solely to them. The achievement of these aims will depend on the involvement and the acceptance of responsibility by individuals at every level in industry. I hope therefore that the Plan itself and the shortened version "Working for Prosperity" will be widely read and discussed throughout the country.

To make the plan work requires above all an acceptance of change. For the manufacturer, changes in what he makes, what he sells, and where he sells it; for the worker, changes in what he does, where he does it, and how he does it, and for all of us a different approach to prices and incomes. Change will often mean disturbance, and we must take care of the effect it has on individuals. But without change there can be no opportunities and no rewards.

George Brown

APPENDIX 44

National Economic Development Council

Extract from the N.E.D.C. Report, Growth of the United Kingdom Economy to 1966, H.M.S.O., February, 1963

INTRODUCTION

The National Economic Development Council met for the first time on 7th March, 1962, when its objects were outlined:

(a) To examine the economic performance of the nation with particular concern for plans for the future in both the private and the public sectors of industry.

(b) To consider together what are the obstacles to quicker growth, what can be done to improve efficiency and whether the best use is being made of our resources.

(c) To seek agreement upon ways of improving economic performance, competitive power and efficiency; in other words, to increase the rate of sound growth.

APPENDIX 45

711 answer booklets (326 carpentry and joinery, 385 electrical) punch-carded for computer analysis [reference Appendix 10 (b)]

Results of Analysis

A) 326 Carpentry and Joinery Students (All day release students)

	College*	Done at Work but Not Seen at College	Done at Work			Done at College			Seen at College		
			Occ/Av	Lot	Never	Occ/Av	Lot	Never	Occ/Av	Lot	Never
25 1st Year Joiners	1	46·04	41·04	56·86	97·10	28·96	32·52	129·72	31·44	34·82	125·34
29 " " "	2	32·38	33·66	54·71	103·64	29·52	39·53	122·95	32·71	42·59	116·71
59 " " "	3	40·06	38·82	39·46	104·26	25·18	20·01	137·37	35·70	22·42	125·31
25 " " "	4	31·44	32·20	62·06	98·62	22·34	38·22	131·60	33·76	44·82	113·42
138 1st Year Joiners		37·83	36·81	50·59	101·65	26·33	30·31	131·55	33·83	33·65	121·09
28 2nd Year Joiners	1	57·54	63·96	74·29	149·82	54·93	48·43	184·71	54·68	55·36	178·04
31 " " "	2	50·06	47·29	102·52	104·19	47·87	71·03	136·06	53·77	79·45	120·77
25 " " "	3	42·72	50·08	94·36	106·32	56·92	55·76	138·08	83·16	66·92	100·68
20 " " "	4	39·05	47·75	95·40	110·35	45·90	67·30	140·80	60·25	81·50	112·05
104 2nd Year Joiners		48·19	52·54	91·59	118·17	51·57	60·56	150·56	62·33	70·35	129·68
242 1st + 2nd Year Joiners		40·80	41·32	62·34	106·38	33·56	38·98	136·99	42·00	44·17	123·55
35 3rd Year Joiners	1	64·31	91·94	142·06	127·37	94·26	81·77	184·86	115·43	96·49	149·34
22 " " "	2	48·26	73·52	106·22	117·30	75·96	77·67	141·96	93·78	97·48	105·70
27 " " "	4	36·09	61·05	133·23	102·82	65·23	98·68	133·09	89·73	121·64	85·64
84 3rd Year Joiners		51·76	77·93	128·23	117·70	80·77	84·88	157·51	101·74	103·39	118·63
326 1st, 2nd + 3rd Year Joiners		42·86	48·20	74·72	108·51	42·43	47·60	140·85	53·22	55·30	122·63

* Code as in Appendix 9.
i.e. 1 = Falkirk Technical College
2 = Stow College of Building, Glasgow
3 = Edinburgh School of Building
4 = Cambuslang School of Building

Note 1 : Each entry in each column represents the averaged out number of operations for the student group concerned. For example, the fourth entry opposite the 25 1st Year Joiners, i.e. 97·10, means that the average number of operations never done by these 25 joiners was 97·10 (i.e. about 97 operations) out of the total 172 carpentry and joinery operations.

Note 2 : The column headed "Occ/Av" includes all operations both for the O (Occasionally) and A (Average Amount) columns of the original answer booklets.

APPENDIX 45 (continued)

B) 385 Electrical Students

{All day release except
{11 1st Year Mining Elect. Students

Done at Work but Not Seen at College }

	College*	Done at Work but Not Seen at College	Done at Work Occ/Av	Done at Work Lot	Done at Work Never	Done at College Occ/Av	Done at College Lot	Done at College Never	Seen at College Occ/Av	Seen at College Lot	Seen at College Never
31 1st Year Elect. Inst. A	6	52·23	51·87	51·42	55·48	26·81	30·74	96·84	25·61	32·03	96·87
13 " "	7	40·77	29·54	73·62	65·08	21·69	60·38	86·92	23·23	62·92	82·85
62 " "	8	56·61	38·32	54·05	70·18	19·44	16·80	126·58	31·38	20·20	110·95
106 1st Year Elect. Inst. A		53·50	41·10	55·62	65·44	21·78	25·88	113·51	28·79	28·58	103·66
10 2nd Year Elect. Inst. A	1	15·30	46·80	121·50	43·30	47·60	127·90	36·50	49·10	129·70	32·60
18 " "	6	69·06	127·56	19·17	65·28	81·33	0	115·00	93·50	0	111·67
20 " "	8	48·70	46·30	91·95	71·60	70·95	51·70	89·35	76·95	54·45	80·60
48 2nd Year Elect. Inst. A		49·37	76·87	70·81	63·33	69·98	0	87·96	77·35	0	82·25
154 1st and 2nd Year Elect. Inst. A		52·25	51·97	60·23	64·80	36·42	0	105·75	43·54	0	97·16
12 3rd Year Elect. Inst. A	6	44·75	73·50	25·58	30·92	50·67	0	75·08	61·58	0	62·17
13 " "	8	18·08	29·08	58·46	42·46	52·54	30·69	46·77	54·92	38·15	36·92
25 3rd Year Elect. Inst. A.		30·88	50·40	42·68	36·92	51·64	0	60·36	58·12	0	49·04
179 1st, 2nd and 3rd Year Elect. Inst. A		49·33	51·75	57·84	60·99	38·50	0	99·55	45·54	0	90·58
13 1st Year Elect. Inst. B	1	37·92	32·15	78·38	58·46	33·85	47·15	86·00	40·15	52·23	76·62
20 " "	6	80·50	69·10	41·50	56·45	18·40	0	173·90	39·65	0	123·40
46 " "	7	41·52	35·74	63·13	66·46	32·13	40·37	93·00	32·04	41·78	91·67
79 1st Year Elect. Inst. B		50·80	43·59	60·16	62·61	28·94	0	112·33	35·30	0	97·23
24 2nd Year Elect. Inst. B	7	13·42	30·08	146·71	30·12	33·50	143·46	30·38	35·58	151·04	20·75
103 1st and 2nd Year Elect. Inst. B		42·09	40·45	80·33	55·04	30·00	0	93·23	35·37	0	79·41
26 1st Year Elect. Fitting	7	21·73	25·08	67·92	71·38	28·42	75·31	60·65	31·08	77·12	56·19
12 2nd Year Elect. Fitting	7	30·05	39·23	67·09	101·95	69·55	52·73	86·00	75·77	49·41	83·14
38 1st and 2nd Year Elect. Fitting	7	25·54	31·56	67·54	85·40	47·27	64·96	72·27	51·56	64·42	68·54
11 (Block Release) 1st Year Mining Elect.	5	0	0	0	153·27	33·36	49·45	75·73	42·64	51·55	64·36
25 2nd Year Mining Elect.	5	50·00	50·48	92·24	69·28	42·68	51·60	115·88	47·12	55·88	107·40
36 1st and 2nd Year Mining Elect.	5	0	0	0	94·94	39·83	50·94	103·61	45·75	54·56	94·25
29 3rd Year Mining Elect.	5	31·69	33·67	63·52	32·52	27·07	43·24	59·69	28·52	45·97	55·52
65 1st, 2nd and 3rd Year Mining Elect.	5	0	0	0	67·09	34·14	47·51	84·02	38·06	50·72	76·97

* see over

0 = not recorded

B) 385 Electrical Students (continued)

* Code as in Appendix 9
i.e. 1 = Falkirk Technical College
6 = Esk Valley College, Midlothian
7 = Ramsay Technical College, Portobello
8 = Stow College of Engineering, Glasgow

Note 1 : Each entry in each column represents the averaged out number of operations for the student group concerned. For example, the fourth entry opposite the 31 1st Year Electrical Installation Course A students, i.e. 55·48, means that the average number of operations never done by these 31 electrical students was 55·48 (i.e. about 55 operations) out of the total of 130 electrical operations.

Note 2 : The column headed "Occ/Av" includes all operations both for the O (Occasionally) and A (Average Amount) columns of the original answer booklets.

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